JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech. for Working Professionals

MINING ENGINEERING

COURSE STRUCTURE & SYLLABUS (WP24 Regulations)

Applicable from AY 2024-25 Batch

I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.	MA101BS	Probability, Statistics & Complex Variables	3	1	0	4
2.	MN102PC	Fluid Mechanics and Hydraulic Machines	3	1	0	4
3.	MN103PC	Mechanics of Solids	3	0	0	3
4.	MN104PC	Development of Mineral Deposits	3	0	0	3
5.	MN105PC	Mechanics of Solids Laboratory	0	0	2	1
6.	MN106PC	Fluid Mechanics and Hydraulic Machines Laboratory	0	0	2	1
		Total Credits	**12**	**2**	**4**	**16**

II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.	MN201PC	Mine Surveying	3	0	0	3
2.	MN202PC	Mine Environmental Engineering	3	0	0	3
3.	MN203PC	Drilling and Blasting	3	0	0	3
4.	MN204PC	Underground Coal Mining Technology	3	0	0	3
5.	MN205PC	Mine Surveying Laboratory	0	0	2	1
6.	MN206PC	Mine Environmental Engineering Laboratory	0	0	2	1
7.	MN207PC	Real-time Research Project/Field-based Project	0	0	4	2
		Total Credits	**12**	**0**	**08**	**16**

III SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.	MN301PC	Introduction to Industrial Engineering	3	0	0	3
2.		Professional Elective – I	3	0	0	3
3.	MN302PC	Mine Mechanization-I	3	0	0	3
4.	MN303PC	Surface Mining Technology	3	0	0	3
5.	MN304PC	Mine Hazards and Rescue	2	0	0	2
6.	MN305PC	Mine Mechanization- I Laboratory	0	0	2	1
7.	MN306PC	Mine Hazards and Rescue Laboratory	0	0	2	1
		Total Credits	**14**	**0**	**4**	**16**

IV SEMESTER

S. No	Course Code	Course Title	L	T	P	Credits
1.		Open Elective – I	3	0	0	3
2.		Professional Elective – II	3	0	0	3
3.	MN401PC	Mine Mechanization-II	3	0	0	3
4.	MN402PC	Underground Metal Mining Technology	3	0	0	3
5.	MN403PC	Mine Mechanization-II Laboratory	0	0	2	1

6.	EN405HS	Advanced English Communication Skills Laboratory	0	0	2	1
7.	MN406PC	Industry Oriented Mini Project/ Internship	0	0	4	2
		Total Credits	**12**	**0**	**08**	**16**

V SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.		Open Elective – II	3	0	0	3
2.		Professional Elective – III	3	0	0	3
3.	MN501PC	Basic Electrical and Electronics Engineering	3	0	0	3
4.	MN502PC	Mine Legislation and General Safety	3	0	0	3
5.	MN503PC	Mineral Processing	2	0	0	2
6.	MN504PC	Basic Electrical and Electronics Engineering Laboratory	0	0	2	1
7.	MN505PC	Mineral Processing Laboratory	0	0	2	1
		Total Credits	**14**	**0**	**04**	**16**

VI SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.		Open Elective – III	3	0	0	3
2.		Professional Elective – IV	3	0	0	3
3.	MN601PC	Rock Mechanics	3	0	0	3
4.	MN602PC	Mining Geology	2	0	0	2
5.	MN603PC	Rock Mechanics Laboratory	0	0	2	1
6.	MN604PC	Mining Geology Laboratory	0	0	2	1
7.	MN605PC	Project Stage - I	0	0	6	3
		Total Credits	**11**	**0**	**10**	**16**

VII SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.	MN701PC	Introduction to Instrumentation	3	0	0	3
2.	MN702PC	Mine Ground Control	3	0	0	3
3.		Professional Elective – V	3	0	0	3
4.		Professional Elective – VI	3	0	0	3
5.	MN703PC	Computer Applications in Mining Laboratory	0	0	2	1
6.	MN704PC	Project Stage – II including seminar	0	0	22	11
		Total Credits	**12**	**0**	**24**	**24**

Professional Elective – I

MN311PE	Environmental Management in Mines
MN312PE	Tunneling Engineering
MN313PE	Mining of Deep-Seated Deposits

Professional Elective – II

MN411PE	Computer Applications in Mining
MN412PE	Advanced Surveying
MN413PE	Material Management in Mines

Professional Elective – III

MN511PE	Risk Assessment and Management
MN512PE	Rock Fragmentation Engineering
MN513PE	Advanced Surface Mining

Professional Elective – IV

MN611PE	Mine Systems Engineering
MN612PE	Rock Slope Technology
MN613PE	Dimensional Stone Technology

Professional Elective – V

MN711PE	Mine Planning and Design
MN712PE	Geo-statistics
MN713PE	Rock Excavation Engineering

Professional Elective –VI

MN721PE	Mine Economics
MN722PE	Mineral Exploration
MN723PE	Mine Subsidence Engineering

LIST OF OPEN ELECTIVES

Open Elective – I

1. Introduction to Mining
2. Underground Coal Gasification

Open Elective – II

1. Health and Safety in Mines
2. Material Handling in Mines

Open Elective – III

1. Sustainable Mineral Industry
2. Tunnelling and Underground Space Technology

MA101BS: PROBABILITY, STATISTICS & COMPLEX VARIABLES

B.Tech. I Sem.

L	T	P	C
3	1	0	4

Pre-requisites: Mathematics courses of first year of study.

Course Objectives: To learn

- The ideas of probability and random variables and various discrete and continuous probability distributions and their properties.
- The basic ideas of statistics including measures of central tendency, correlation and regression.
- The statistical methods of studying data samples.
- Differentiation and integration of complex valued functions.
- Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem.
- Expansion of complex functions using Taylor's and Laurent's series.

Course outcomes: After learning the contents of this paper the student must be able to

- Formulate and solve problems involving random variables and apply statistical methods for analyzing experimental data.
- Apply concept of estimation and testing of hypothesis to case studies.
- Analyze the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems.
- Taylor's and Laurent's series expansions of complex function.

UNIT-I: Basic Probability **8 L**

Probability spaces, conditional probability, independent events, and Baye's theorem.
Random variables: Discrete and continuous random variables, Expectation of Random Variables, Variance of random variables

UNIT-II: Probability distributions **10 L**

Binomial, Poisson, evaluation of statistical parameters for these distributions, Poisson approximation to the binomial distribution, Continuous random variables and their properties, distribution functions and density functions,
Normal and exponential, evaluation of statistical parameters for these distributions

UNIT-III: Estimation & Tests of Hypotheses **10 L**

Introduction, Statistical Inference, Classical Methods of Estimation.: Estimating the Mean, Standard Error of a Point Estimate, Prediction Intervals, Estimating a Proportion for single sample, Difference between Two Means, difference between two proportions for two Samples.
Statistical Hypotheses: General Concepts, Testing a Statistical Hypothesis, Tests Concerning a Single Mean, Tests on Two Means, Test on a Single Proportion, Two Samples: Tests on Two Proportions.

UNIT-IV: Complex Differentiation **10 L**

Limit, Continuity and Differentiation of Complex functions, Analyticity, Cauchy-Riemann equations (without proof), finding harmonic conjugate, elementary analytic functions (exponential, trigonometric, logarithm) and their properties, Conformal mappings, Mobius transformations.

UNIT-V: Complex Integration **10 L**

Line integral, Cauchy's theorem, Cauchy's Integral formula, Zeros of analytic functions, Singularities, Taylor's series, Laurent's series, Residues, Cauchy Residue theorem (All theorems without Proof).

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.

2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, keying Ye, Probability and statistics for engineers and scientists, 9th Edition, Pearson Publications.

REFERENCE BOOKS:

1. Fundamentals of Mathematical Statistics, Khanna Publications, S. C. Guptha and V. K. Kapoor.
2. Miller and Freund's, Probability and Statistics for Engineers, 8th Edition, Pearson Educations.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
4. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Edition, Mc-Graw Hill, 2004.

MN102PC: FLUID MECHANICS AND HYDRAULIC MACHINES

B.Tech. I Sem.

L	T	P	C
3	1	0	4

Course Objectives: The objectives of the course are to enable the student;

- To understand the basic principles of fluid mechanics
- To identify various types of flows
- To understand boundary layer concepts and flow through pipes
- To evaluate the performance of hydraulic turbines
- To understand the functioning and characteristic curves of pumps

Course Outcomes:

- Able to explain the effect of fluid properties on a flow system.
- Able to identify type of fluid flow patterns and describe continuity equation.
- To analyze a variety of practical fluid flow and measuring devices and utilize Fluid Mechanics principles in design.
- To select and analyze an appropriate turbine with reference to given situation in power plants.
- To estimate performance parameters of a given Centrifugal and Reciprocating pump.
- Able to demonstrate boundary layer concepts.

UNIT - I

Fluid statics: Dimensions and units: physical properties of fluids- specific gravity, viscosity, and surface tension - vapour pressure and their influence on fluid motion- atmospheric, gauge and vacuum pressures – measurement of pressure- Piezometer, U-tube and differential manometers.

UNIT - II

Fluid kinematics: Stream line, path line and streak lines and stream tube, classification of flows-steady & unsteady, uniform & non-uniform, laminar & turbulent, rotational & irrotational flows-equation of continuity for one dimensional flow and three-dimensional flows.

Fluid dynamics: Surface and body forces –Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its application on force on pipe bend.

UNIT - III

Boundary Layer Concepts: Definition, thicknesses, characteristics along thin plate, laminar and turbulent boundary layers (No derivation) boundary layer in transition, separation of boundary layer, submerged objects – drag and lift.

Closed conduit flow: Reynold's experiment- Darcy Weisbach equation- Minor losses in pipes- pipes in series and pipes in parallel- total energy line-hydraulic gradient line. Measurement of flow: Pitot tube, venturi meter, and orifice meter, Flow nozzle

UNIT - IV

Basics of turbo machinery: Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

Hydraulic Turbines: Classification of turbines, Heads and efficiencies, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design –draft tube theory- functions and efficiency.

Performance of hydraulic turbines: Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer.

UNIT - V

Centrifugal pumps: Classification, working, work done – barometric head- losses and efficiencies specific speed- performance characteristic curves, NPSH.
Reciprocating pumps: Working, Discharge, slip, indicator diagrams.

TEXT BOOKS:

1. Hydraulics, Fluid mechanics and Hydraulic Machinery - MODI and SETH.
2. Fluid Mechanics and Hydraulic Machines by Rajput.

REFERENCE BOOKS:

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria & Sons.
2. Fluid Mechanics and Machinery by D. Rama Durgaiah, New Age International.
3. Hydraulic Machines by Banga & Sharma, Khanna Publishers.

MN103PC: MECHANICS OF SOLIDS

B.Tech. I Sem.

L	T	P	C
3	0	0	3

Course Pre-Requisites: Engineering Mechanics

Course Objectives: The objectives of this course are to:

1. Understand the concepts of internal forces, moments, stress, strain, and deformation of solids with applications to bars, beams, and columns.
2. Learn the fundamentals of applying equilibrium, compatibility, and force-deformation relationships to structural elements.
3. Study twisting of circular bars and hollow shafts acted on by torsional moments.
4. Define the state of stress at a point on a body and to develop stress transformations.
5. Introduce the concept of theories of elastic failure and their significance in the design.

Course Outcomes: At the end of the course, students will be able to:

1. Evaluate the internal forces, moments, stresses, strains, and deformations in structures made of various materials acted on by a variety of loads.
2. Draw axial force, shear force and bending moment diagrams for beams and frames.
3. Develop the Bending and Torsion formula and apply to the design of beams and shafts.
4. Use the stress transformation equations to find the state of stress at a point for various rotated positions of the stress element and display the same in graphical form as Mohr's circle.
5. Understand the different criteria for the safety of the component by applying the theories of elastic failure.

UNIT – I:

Simple Stresses & Strains: Elasticity and plasticity – Types of stresses & strains–Hooke's law– stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric strain – Elastic moduli & the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

UNIT – II:

Shear Force and Bending Moment: Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l., uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT – III:

Flexural Stresses: Theory of simple bending – Assumptions – Derivation of bending equation: M/I = f/y = E/R Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

Shear Stresses: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T angle sections.

UNIT – IV:

Principal Stresses and Strains: Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr's circle of stresses – Principal stresses and strains – Analytical and graphical solutions.

Theories of Failure: Introduction – Various theories of failure - Maximum Principal Stress Theory, Maximum Principal Strain Theory, Strain Energy and Shear Strain Energy Theory (Von Mises Theory).

UNIT – V:

Torsion of Circular Shafts: Theory of pure torsion – Derivation of Torsion equations: $T/J = q/r = N\theta/L$ – Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure.

Columns and Struts: Euler's Theory, Limitations of Euler's theory, Equivalent Length, Rankine's Formula, Secant Formula.

TEXT BOOKS:

1. Barry J. Goodno and James M. Gere, "Mechanics of Materials" Ninth Edition, Cengage Learning,2018.
2. S. S. Rattan, "Strength of Materials", Second Edition Tata McGraw Hill Education Pvt. Ltd, New Delhi,2011

REFERENCE BOOKS:

1. U. C. Jindal, "Strength of Materials", Pearson Education India,2012
2. Egor P. Popov, Toader A. Balan, "Engineering Mechanics of Solids", PHI Learning, 2010
3. G. H. Ryder, "Strength of Materials", Macmillan Long Man Publications, 1961
4. W. A. Nash and M. C. Potter, "Strength of Materials", Fifth Edition, Schaum's Outline Series, 2011

MN104PC: DEVELOPMENT OF MINERAL DEPOSITS

B.Tech. I Sem.

L	T	P	C
3	0	0	3

Course Objective: Course introduces underground and surface mining methods along with the associated activities such as drilling, blasting and supporting for mines. Modes of entry into the underground mines with special emphasis on various shaft sinking methods for development of mineral deposits are also described.

Course Outcomes: At the end of the course the student will be able to

1. Know the status and significance of mining Industry.
2. Apply different methods of Shaft sinking according to the ground conditions.
3. Know about Development of workings.
4. Know about different types of supports, their advantages and disadvantages.
5. Know about different tunneling methods.

UNIT-I

Historical overview of mining, Distribution of mineral deposits in India and other countries, mining contributions to civilization, mining terminology, stages/operation in the life of the mine, introduction to underground and surface mining methods. Positive and negative aspects of mining.

UNIT-II

Introduction to drilling and drilling equipment. Types of explosives used for open cast and underground mining methods, initiating devices, short firing tools.

UNIT-III

Location of shaft, shape and size, incline and vertical shafts. Surface arrangements for sinking shafts, tools and equipments, ordinary methods of sinking, drilling, blasting, removal of debris and water, ventilation and lighting, temporary and permanent lining. Widening and deepening of shafts, special methods of shaft sinking: piling, caisson, freezing and cementation method of shaft sinking. Modern techniques of shaft sinking like shaft boring, shaft rising.

UNIT-IV

Modes of entry into deposits for underground mining- shafts, inclines, adits – their fields of applications. Drivage of drifts, organization and cycle of operations, modern methods of drifting and tunneling, road headers, tunnel boring.

UNIT-V

Objectives of mine supports, Types of supports; hydraulic props, Roof bolts, Powered supports, Timber supports, Roadway support, face supports, side supports, junction supports, supports in special conditions, setting and withdrawal of supports, systematic supporting Rules.

TEXT BOOKS:

1. Introductory mining engineering- Wiley India (P) Ltd, Howard L. Hartman, Jan M. Mutmansky.
2. Elements of mining technology Vol-I - D.J. Deshmukh

REFERENCE BOOKS:

1. Blasting in ground excavations and mines, Roy Pijush Pal, Oxford and IBH, 1st ed 1993
2. Drilling technology handbook, C.P. Chugh, Oxford and IBH, 1st ed, 1977

MN105PC: MECHANICS OF SOLIDS LABORATORY

B.Tech. I Sem.

L	T	P	C
0	0	2	1

Course Objectives:

- Understand basic knowledge on the mechanical behavior of materials like aluminum, mild steel, and cast iron.
- Adopt with the experimental methods to determine the mechanical properties of materials.

Course Outcomes:

- Identify microstructures and wear properties of engineering materials.
- Examine the defects in the materials by non-destructive testing
- Test the important mechanical properties of ferrous and non-ferrous materials.

List of Experiments:

1. **Brinell Hardness Test:** Determination of Brinell number of a given test specimen.
2. **Rockwell Hardness Test:** Determination of hardness number of different specimens such as steel, brass, copper and aluminum.
3. **Tension Test:** Study the behavior of mild steel and various materials under different loads. To determine
    a) Tensile
    b) Yield strength
    c) Elongation
    d) Young ‘s modulus
4. **Torsion Test:** Determine of Modulus of rigidity of various specimens.
5. **Izod Impact Test:** Determination the toughness of the materials like steel, copper, brass and other alloys using Izod test
6. **Charpy Impact Test:** Determine the toughness of the materials like steel, copper, brass and other alloys using Charpy test.
7. **Compression Test on Short Column:** Determine the compressive stress on material.
8. **Compression Test on Long Column:** Determine Young ‘s modulus of the given long column.
9. **Testing of Springs: Determine** the stiffness of the spring and the Modulus of rigidity of wire material.
10. **Deflection Test For SSB And Cantilever Beam: Determine** the Young‘s modulus of the given material with the help of deflection of SSB and cantilever beam

TEXT/ REFERENCE BOOKS:

1. Gere, Timoshenko, —Mechanics of Materials‖, McGraw Hill, 3rd Edition, 1993.
2. R. S Kurmi, Gupta, —Strength of Materials‖, S. Chand, 24th Edition, 2005.
3. William Nash, —Strength of Materials‖, Tata McGraw Hill, 4th Edition, 2004.

MN106PC: FLUID MECHANICS AND HYDRAULIC MACHINES LABORATORY

B.Tech. I Sem.

L	T	P	C
0	0	2	1

Pre-Requisites: NIL

Course Objectives:

- To understand the basic principles of fluid mechanics.
- To identify various types of flows.
- To understand boundary layer concepts and flow through pipes.
- To evaluate the performance of hydraulic turbines.
- To understand the functioning and characteristic curves of pumps.

Course Outcomes:

- Able to explain the effect of fluid properties on a flow system.
- Able to identify type of fluid flow patterns and describe continuity equation.
- To analyze a variety of practical fluid flow and measuring devices and utilize fluid mechanics principles in design.
- To select and analyze an appropriate turbine with reference to given situation in power plants.
- To estimate performance parameters of a given Centrifugal and Reciprocating pump.
- Able to demonstrate boundary layer concepts

List of Experiments:

1. Impact of jets on Vanes.
2. Performance Test on Pelton Wheel.
3. Performance Test on Francis Turbine.
4. Performance Test on Kaplan Turbine.
5. Performance Test on Single Stage Centrifugal Pump.
6. Performance Test on Multi Stage Centrifugal Pump.
7. Performance Test on Reciprocating Pump.
8. Calibration of Venturimeter.
9. Calibration of Orifice meter.
10. Determination of friction factor for a given pipe line.
11. Determination of loss of head due to sudden contraction in a pipeline.
12. Verification of Bernoulli's Theorems.

MN201PC: MINE SURVEYING

B.Tech. II Sem.

L	T	P	C
3	0	0	3

Course Objectives: To introduce various technologies of surveying on the surface and underground mining situations including distance measurements, leveling, contouring, traversing etc along with descriptions of associated instruments.

Course Outcomes:

1. The students obtain the knowledge of plane surveying, remote surveying, GIS and total station.
2. Acquire the concepts of levelling and handling of levelling equipments.
3. Get the exposure theodolite and its traversing techniques.
4. Understand the procedures for evaluation of areas, volumes of open pit, dumps and reservoirs.
5. Know the knowledge of correlation and modern techniques of survey.

UNIT – I

Introduction: overview of Plane Surveying (Chain, compass, and plane table-in brief): Objectives, Principles and classifications; electronic distance measurements; Types of compasses, different types of meridians and bearings, local attraction and closed traversing with compass; computation of angles from bearings; declination.

Global Positioning System: Introduction to Global Information System (GIS), Remote Sensing – basic Principles, Integration of RS, GIS and Laser scanning.

Total Station: Description, uses, types of surveys by total station, mapping of sites by total station surveys – elementary exercises only.

UNIT-II

Levelling: Different types leveling instruments and description of parts; Temporary and Permanent adjustments; methods of levelling – fly levelling, differential levelling, and reciprocal levelling. Problems on leveling. Permissible error and distribution of error. RL calculation.

Contouring: Characteristics and uses of contour; contour interval; methods of establishing contours.

UNIT-III

Theodolite – description of parts; Temporary and Permanent Adjustments, Measurement of horizontal and vertical angles, Trigonometric levelling.

Traversing with Theodolite: Principles of traversing, open traverse and closed traverse using theodolite; Latitude and Departure : consecutive co-ordinates/ dependent co-ordinates and independent co-ordinates/ total coordinates; closing error and correction in closed traversing by different methods- Bowditch method, transit method.

Triangulation: Principles and methods of triangulation: classification of triangulation system, signals and towers; base line measurement; calculations of length of base- tape corrections.

UNIT-IV

Computation of Areas and Volumes: Areas from field notes, computation of Areas along irregular boundaries and regular boundaries. Embankments and cuttings, determination of capacity of reservoir/volume.

Tacheometric Surveying: – Principles, Stadia and tangential methods, measurements of heights and distances by tacheometry, distance and elevation formulae for staff vertical and normal; anallactic lens.

Curves: Definitions and types of curves; simple curves by linear and angular method (Rankine's method); setting of underground curve.

UNIT-V

Correlation Survey: classification and purposes of correlation survey; different methods- single shaft (co-plantation method, weissbach triangle method) and two shaft (Weiss quadrilateral method)

Miscellaneous: EDM and modern instruments, open pit surveys, mine plans and sections, Statutory requirements.

TEXT BOOKS:

1. Surveying (Vol-1, 2 & 3) by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain- Laxmi Publications (P) Ltd., New Delhi.
2. "Surveying (Vol-1 &2), DUGGAL S K Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2004
3. Text book of surveying by C. Venkataramaiah, Universities Press.
4. Surveying (Vol 1 & 2) – Kanitkar
5. Mine Surveying (Vol 1 & 2) by Ghatak, Lovely Prakasan publishers, Dhanbad.

REFERENCE BOOKS:

1. Elements of Plane Surveying, Arthur R. Benton and Philip J Taetly, McGraw Hill-2000
2. Surveying Vol 1 & 2 & 3, Arora K R Standard Book House, Delhi, 2004.
3. Plane Surveying, Chandra A M, New age International Pvt. Ltd., Publishers, New Delhi, 2002.
4. Higher Surveying, Chandra A M, New age International Pvt. Ltd, Publishers, New Delhi, 2002.
5. Surveying and Levelling by R Subramanian, Oxford University Press, New Delhi.

MN202PC: MINE ENVIRONMENTAL ENGINEERING

B.Tech. II Sem.

L	T	P	C
3	0	0	3

Course Objectives: In view of very difficult /uncomfortable environment envisaged in deeper mines in future, this course aims at sampling and analysis of mine air, understanding of heat, humidity, distribution of air, natural ventilation etc for underground mines. Mechanical ventilation devices including auxiliary fans, booster fans etc are also covered in this course.

Course Outcomes: At the end of the course, students will be able to

1. Understand origin, physical and chemical properties of mine gases and their physiological effects
2. Understand Heat, Humidity and Air flow in mines
3. Understand Principal types of mine fans, Series and parallel operation of mine fans
4. Understand Standards of ventilation and Air distribution
5. Understand Ventilation Planning and Network analysis.

UNIT - I

Mine Gases: Origin, occurrence, physical, chemical and physiological properties of mine gases, instruments used for spot detection of mine gases. Various damps, methane drainage techniques. Gas chromatography.

UNIT - II

Mine Climate and Control: Sources of heat and humidity in mines and their effects, instruments used for measurement of temperature, humidity, pressure and velocity. Heat stress indices, cooling power and method of improving cooling power.

UNIT - III

Natural Ventilation and Laws of Air flow: Natural ventilation, Factors effecting NVP, Direction of air flow, Derivation of NVP, Motive column, Atkinson law governing airflow in mine openings.

UNIT - IV

Mechanical Ventilation: Definition of Mechanical ventilation, Different types of fans and their characteristics, Operating point, Fan laws, installation. Ventilation appliances, economic size of roadways, determination of quantity and head requirements. Fan selection and evasee. Ventilation networks: simple and complex, solutions to simple ventilation network. Introduction to Hardy cross method for solving complex network. Introduction to ventilation software's.

UNIT - V

Ventilation Planning: Standards of ventilation, ascensional ventilation, descensional ventilation, ventilation planning for different mining methods: Bord and pillar, Longwall mining method and cut and fill, sub level caving and shrinkage stoping method.

TEXT/ REFERENCE BOOKS:

1. Mine Environment and Ventilation. Mishra GB. Oxford University Press, 1992.
2. Mine Ventilation and Air Conditioning. Hartman HL. Wiley Interscience publication, 1993.
3. Subsurface Ventilation and Environmental Engineering. Pherson Mc. Chapman and Hall Publication, London, 1993.
4. Mine Environment Engineering. Vutukuri VS. Trans Tech Publishers, 1986

MN203PC: DRILLING AND BLASTING

B.Tech. II Sem.

L	T	P	C
3	0	0	3

Course Objectives: To familiarize the students

1. With exploratory and production drilling.
2. The factors affecting drilling;
3. Various types of the explosives and blasting techniques used in underground.
4. Transportation and handling of explosives in opencast mines; use of accessories for blasting in opencast mines.
5. Controlled blasting and use of computers and software for blasting in open cast mining.

Course Outcomes: At the end of the course, students will be able to

1. Gain knowledge about exploratory/diamond drilling, use of fishing tools.
2. Understands various methods of drilling, design and selection of drilling methods under or for different conditions.
3. Knowledge about explosives and blasting techniques in underground mines and open cast mines.
4. Makes student confident in design of blasting operations in the field.
5. Learn about controlled blasting, use of softwares in rock blasting.

UNIT - I

Exploratory Drilling: Drilling for exploration and other purposes; diamond drilling-equipment and principal of operation, its merits, demerits and limitations; core recovery — single, double and triple tube core barrels; wire line drilling; directional drilling; fishing tools; borehole surveying; borehole logging; novel and special drilling techniques, Horizontal and directional drilling.

UNIT - II

Production of Drilling: Various methods and mechanics of drilling -percussive, rotary and rotary percussive. Jack hammer drilling, Top hammer and Down the Hole (DTH) hammer and rotary drills.

Drillability: Drillability studie**s,** Factors affecting drilling- operational parameters (like air pressure, thrust, r.p.m., flushing, bit type and bit geometry) and physico-mechanical properties (like strength properties, hardness, abrasivity etc.) design and selection of drills and drill bits; bit wear and reconditioning of drill bits.

UNIT - III

Explosives: Classification and properties of explosives, Types of explosives – Permitted type and their importance, slurry explosives, SMS and PMS, ANFO, Emulsion, boosters. Mechanics of blasting.

Accessories and Tools: Accessories- different types of detonators, safety fuses, detonating cords, relays, NONEL, exploders and other shot firing tools, testing of explosives, storage, transportation and handling and destruction of explosives and accessories.

UNIT - IV

Open Pit Blasting: Blasting in opencast mines, blast design, factors influencing blast design and blast optimization, primary and secondary blasting; environmental impacts due to blasting- ground vibrations, air over pressures, fly rocks, dust, fumes, water pollution;
controlled blasting, computer design of opencast blast; statutory requirements. Introduction to different blasting and fragmentation analysis softwares.

UNIT - V

Underground Blasting: Drill patterns for underground excavations, solid blasting; VCR blasting, induced blasting, charge ratios, rock fragmentation, dangers associated with underground blasting,

blasting economics, gallery blasting, statutory requirements, computer design of underground blast, precautionary measures, misfires, blown out shot and blasting economics.

TEXT BOOKS:

1. Blasting in ground excavations and mines, Roy Piyush Pal, Oxford and IBH, 1st ed 1993.
2. Drilling technology handbook, C.P. Chugh, Oxford and IBH, 1sted, 1977.

REFERENCE BOOKS:

1. Rock blasting effect and operation, Roy Piush Pal, A.A. Balkema, 1st ed, 2005.
2. Elements of mining technology, Vol-1, D.J. Deshmukh, Central techno, 7th ed, 2001.
3. Blasting operations, B. Hemphill Gary, Mc-Graw Hill, 1st ed 1981.
4. Principles and practices of modern coal mining, R.D. Singh, New age International, 1st ed, 1977.
5. Explosive and blasting practices in mines, S.K. Das, Lovely prakashan, 1st ed, 1993.

MN204PC: UNDERGROUND COAL MINING TECHNOLOGY

B.Tech. II Sem.

L	T	P	C
3	0	0	3

Course Objectives:

1. To study the development of panels and extraction of coal in Bord and Pillar method.
2. To study the Longwall advancing and retreating methods.
3. To study the various special methods of winning coal.
4. To study and update of the mine criteria as per various legislation of India.
5. To know the various statutory aspects like CMR, MMR and the relevant DGMS circulars related to this course.

Course Outcomes: The students will gain knowledge on the following:

1. Development and depillaring of coal by Bord and Pillar.
2. Longwall mining by advancing and retreating methods.
3. Extraction of thick seams by slice mining.
4. Methods of winning of coal seams which are liable to spontaneous leaching and coal lumps.
5. Extraction of coal seams by blasting gallery methods, underground coal gasification and horizon mining.

UNIT - I

Introduction: Status of coal industry and deposit, estimation and classification coal reserves, Mode of entry by incline, shaft and adit; their application, advantages and disadvantages, factors affecting choice of mining methods, classification of mining methods, grading and analysis of coal.

UNIT - II

Bord And Pillar Method-Development: Design and development of a district / panel, sizes and shapes of galleries and pillars, bord and pillar, room and pillar methods, development of panel with semi mechanized equipment like LHD, SDL, Gathering Arm Loader with shuttle car and continuous miner.

UNIT- III

Bord and Pillar Method – Extraction: Pillar extraction by caving and stowing methods; mechanised extraction of pillars, shaft pillar extraction, systematic supports, surface, underground and face arrangements for stowing. Partial extraction.

UNIT- IV

Longwall Method: Longwall advancing and retreating methods, development of panel, extraction of coal longwall mining with different machines-plough and shearer, design of longwall workings-optimum length of face, size of panel, gates, support system, personnel, organisation and safety measures, salvaging and relocations of equipment.

UNIT- V

Special Methods of Working: Problems of working thick & thin seams, Sublevel caving, Horizon mining, blasting gallery method, working of contiguous seams, working steeply inclined seams, working under surface structures and seams liable to spontaneous heating, outburst and bumps, etc. Hydraulic mining, Wongawalli mining method, shortwall, underground coal gasification, coal bed methane, shield mining; Thick seam mining methods- slice mining methods- Inclined slice mining with mechanized longwall mining.

TEXT BOOKS:

1. Principles and Practices of Modern Coal Mining, Singh, R.D. New Age International (P) Ltd., Chennai, 1994.
2. Longwall Mining, Peng S.S., and Chiang, H.S., John Willey and Sons, New York, 1992.

REFERENCE BOOKS:

1. Underground Winning of Coal – Singh, T.N. Singh, Oxford & IBH Publishing Co. Ltd.,1992.
2. Coal Mining in India, Mathur, S.P., M.S. Enterprises, Bilaspur, 1999.
3. Modern Coal Mining Technology Das S.K., Lovely Prakashan, Dhanbad 1994.
4. Thick Seam Mining, Problems and Issues, Singh T.N., Dhar, B.B. Oxford & IBH Publishers, 1992.
5. Mining Planning for Coal., Mathur, S.P., M.G. Consultants, Bilaspur, 1993.
6. Underground Mining Methods and Technology, Szwilski and Richards M.J., 1987.
7. Internet: www.miningindia.com.

MN205PC: MINE SURVEYING LABORATORY

B.Tech. II Sem.

L	T	P	C
0	0	2	1

Pre-Requisites: Mine Surveying

Course Objectives: To familiarize with the various surveying instruments and methods.

Course Outcomes: At the end of the course, students will be able to

1. Do the Range and to measure the distance between two points
2. Conduct the chain triangulation survey
3. Determine the area by using different methods
4. Determine the elevation of a given point
5. Use the instruments used in the surveying

LIST OF EXPERIMENTS:

1. Ranging a line, measuring the distance between two points, pacing
2. Chain triangulation, booking, calculation of areas and plotting
3. Fly leveling and Reduction of level
4. Contouring
5. Measurement of Horizontal angle
6. Measurement of vertical angle
7. Determination of constants k and C by tacheometric surveying
8. Tacheometric surveying by stadia method- distance and elevation formulae for staff vertical
9. Curve ranging by offsets/ordinates from the long chord
10. Curve ranging by Rankine's method of tangential (or deflection) angle
11. Correlation in single shaft by Weisbach triangle method
12. Correlation in two shafts by Weiss quadrilateral method
13. Reading mine plans and sections
14. Measurement of volumes using Total station

MN206PC: MINE ENVIRONMENTAL ENGINEERING LABORATORY

B.Tech. II Sem.

L	T	P	C
0	0	2	1

Pre-Requisites: Mine Environmental Engineering

Course Objective: To determine the psychrometric properties, gas percentage in atmosphere. To study the principles and characteristics governing mine fans. To understand lamp design and perform underground illumination surveys. To understand the temporary and permanent stoppings, preventive measures for mine explosions and rescue apparatus.

Course Outcomes: At the end of the course, students will be able to

1. Determine the psychrometric properties, gas percentage in atmosphere.
2. Determine the relative humidity by hygrometer.
3. Knowledge of principles and characteristics governing mine fans.
4. Analyses ventilation network circuit.
5. Knowledge of mine air-conditions plant.

LIST OF EXPERIMENTS

1. Detection of mine gases
2. Orsat/Haldane apparatus for gas analysis.
3. Measurement of relative humidity by hygrometer.
4. Kata thermometer.
5. Constructional features of centrifugal and axial flow fans.
6. Characteristic curves for fans.
7. Operation of fans in series and parallel.
8. Design of various ventilation devices, Airshaft, Evasese, Doors crossing regulators.
9. Reversal of Ventilation system.
10. Measurement of air quantity by anemometer velometer and smoke tube, pressure survey.
11. Measurement of relative humidity by hygrometer.
12. Study and analysis ventilation network circuit.
13. Study of mine air-conditioning plant.
14. Study of Constructional features of a flame safety lamp and cap lamp, accumulation and percentage

MN301PC: INTRODUCTION TO INDUSTRIAL ENGINEERING

B.Tech. III Sem.

L	T	P	C
3	0	0	3

Course Objective: To understand the Management Concepts, applications of Concepts in Practical aspects of business and development of Managerial Skills.

Course Outcome: At the end of the course, the student will be able to

1. Understand the planning process and business strategy
2. Apply the Principles of management
3. Design the organizational structure and organizational culture
4. Acquire the concepts of authority and delegation.
5. Apply the strategies for control

UNIT- I

Introduction to Management: Definition, Nature and Scope, Functions, Managerial Roles, Levels of Management, Managerial Skills, Challenges of Management; Evolution of Management- Classical Approach- Scientific and Administrative Management; The Behavioral approach; The Quantitative approach; The Systems Approach; Contingency Approach, IT Approach.

UNIT- II

Planning and Decision Making: General Framework for Planning - Planning Process, Types of Plans, Management by Objectives; Development of Business Strategy. Decision making and Problem Solving - Programmed and Non-Programmed Decisions, Steps in Problem Solving and Decision Making; Bounded Rationality and Influences on Decision Making; Group Problem Solving and Decision Making, Creativity and Innovation in Managerial Work.

UNIT- III

Organization and HRM: Principles of Organization: Organizational Design & Organizational Structures; Departmentalization, Delegation; Empowerment, Centralization, Decentralization, Recentralization; Organizational Culture; Organizational Climate and Organizational Change.

Human Resource Management & Business Strategy: Talent Management, Talent Management Models and Strategic Human Resource Planning; Recruitment and Selection; Training and Development; Performance Appraisal.

UNIT- IV

Leading and Motivation: Leadership, Power and Authority, Leadership Styles; Behavioral Leadership, Situational Leadership, Leadership Skills, Leader as Mentor and Coach, Leadership during adversity and Crisis; Handling Employee and Customer Complaints, Team Leadership.

Motivation - Types of Motivation; Relationship between Motivation, Performance and Engagement, Content Motivational Theories - Needs Hierarchy Theory, Two Factor Theory, Theory X and Theory Y.

UNIT - V

Controlling: Control, Types and Strategies for Control, Steps in Control Process, Budgetary and Non-Budgetary Controls. Characteristics of Effective Controls, Establishing control systems, Control frequency and Methods

Statistical Quality Control: variables-attributes, Shewart control charts for variables- chart, R chart, – Attributes- Defective-Defect- Charts for attributes-p-chart -c chart (simple Problems), Acceptance Sampling- Single sampling- Double sampling plans-OC curves.

TEXT BOOKS:

1. Management Fundamentals, Concepts, Applications and skill Development, Robert N Lussier, 7th edition, Cengage Learning, 2015.

2. Fundamentals of Management, Stephen P. Robbins, MARY COULTER, DAVID A. DECENZO, 11th Edition, Pearson.

REFERENCE BOOKS:

1. Essentials of Management, Harold Koontz, Weihrich, Tata Mc - Graw Hill, 10th Edition, 2015.
2. Management Essentials, Andrew Du Brin, 9e, Cengage Learning, 2012.
3. Industrial Engineering and Management/O.P. Khanna/Khanna Publishers/1st Edition.
4. Industrial Engineering and Management Science/T.R. Banga and S. C. Sarma/Khanna Publishers, 1st Edition, 2020.
5. Human factors in Engineering & Design/Ernest J McCormick /TMH, 7th Edition, 1992.

MN311PE: ENVIRONMENTAL MANAGEMENT IN MINES
(Professional Elective – I)

B.Tech. III Sem.

L	T	P	C
3	0	0	3

Pre-Requisites: NIL

Course Objectives:

1. Understanding the importance of ecological balance for sustainable development.
2. Understanding the impacts of developmental activities and mitigation measures
3. Understanding the environmental policies and regulations

Course Outcomes: After going through this course, students

1. understand about importance of ecosystem and global environment
2. know about the environmental impacts due to mining industry.
3. gain knowledge on legislation and environmental impact assessment.
4. get to know about preventive measures on various Environmental Pollution and health hazards.
5. understand the Concept of Sustainable Development and Environmental Management Plan (EMP).

UNIT - I

Ecosystems: Definition, Scope and Importance of ecosystem. Classification, structure and function of an ecosystem, Food chains, food webs and ecological pyramids. Flow of energy. Introduction to environmental impacts due to mining.

UNIT - II

Global Environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol and Montréal Protocol.

UNIT - III

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants, Ambient air quality standards and control measures. Water pollution: Sources and types of pollution, drinking water quality standards, control measures. Soil Pollution: Sources and types, Impacts of mining on soil. Noise Pollution: Sources and Health hazards, standards. Pollution control technologies: Waste water Treatment methods: Primary, secondary and Tertiary.

UNIT - IV

Environmental Policy, Legislation & EIA: Environmental Protection act 1986, Legal aspects Air Act-1981, Water Act, Forest Act, Wild life Act

UNIT - V

EIA: EIA structure, methods of baseline data acquisition. Concepts of Environmental Management Plan (EMP). Towards Sustainable Future: Concept of Sustainable Development.

TEXT BOOKS:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHI Learning Private Ltd. New Delhi.

2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela .2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

MN312PE: TUNNELING ENGINEERING (Professional Elective – I)

B.Tech. III Sem.

L	T	P	C
3	0	0	3

Pre-Requisites: NIL

Course Objectives: To familiarize the subjects with the recent trends in tunneling methods including design of supports, maintenance off tunnels, provision of facilities such as ventilation, illumination etc. in tunnels.

Course Outcomes: By the end of this course, students can

1. gain knowledge about the geo-mechanical properties of rock mass.
2. Understand maintenance of tunnels based on ventilation, illumination and dewatering.
3. Acquire knowledge on various methods of tunneling
4. Know about design of support system in surface and underground tunnels.
5. Able to use latest numerical techniques for tunnel design, stability analysis. and ground control measures

UNIT-I

Introduction to tunneling; geological parameters to be considered for tunneling. Influence of geological aspects on design & construction of tunnels. Types of underground excavations.

UNIT-II

Different methods of tunneling; Conventional and special drill & blast roadway drivage methods, Tunnel Boring Machine (TBM);

UNIT-III

Stresses and displacements associated with excavating tunnels, ground control or treatment in tunneling and drivages.

Design of Supports of Tunnels; Steel supports, rock enforcements, new Australian tunneling methods (NATM)

UNIT-IV

Design of Tunnels: Rock conditions, RMR, Q-system, RSR, rock mass behavior, stress strain behavior, and stress analysis of tunnels.

Maintenance: Dewatering, ventilation and illumination drivages tunnels.

UNIT-V

Tunneling in soft ground; Excavation of large tunnels; hazards in tunneling. Ground treatment in excavation.; application of road headers and drill jumbos in tunneling: principle of operation, applicability, advantages and limitations. Applications of numerical techniques and relevant software's in tunneling (in brief).

TEXT BOOKS:

1. Tunneling and Underground Construction Techniques – Richards E. Bullock
2. Hand Book of Mining and Tunneling Machinery –Stack Barbara John Wiley & Sons.

REFERENCE BOOKS:

1. Rock Tunneling with Steel Supports – R.V. Proctor.
2. Modern Trends in Tunneling and Blast Design – J. Johnsen.

MN313PE: MINING OF DEEP-SEATED DEPOSITS (Professional Elective – I)

B.Tech. III Sem.

L	T	P	C
3	0	0	3

Pre-Requisites: NIL

Course Objectives: To give very highly specialized knowledge to the upcoming mining professionals with future demand of deep seam mining for coal extraction.

Course Outcomes: By end of this course, students will

1. Learn about the classification of complex coal deposits.
2. Identify the challenges, development and design of deep-seated deposits
3. Understand numerical modelling techniques of strata control, monitoring and modern technologies for stability analysis.
4. Learn the usage of modern instruments for strata controlling in deep seated deposits.

UNIT-I

Exploration: Modern Exploration Techniques to Identify the Complex Coal Deposits
Classification: Classification of Coal Deposits Lying under Typical Geo-mining conditions.

UNIT-II

Challenges: Challenges to improve production and productivity from Deep Seated Deposits.
Challenges in Liquidation of Locked-up Pillars
Experimental Trials: Innovative Technologies for Stability Analysis.

UNIT-III

Design and Development of Deep Seated Deposits.

UNIT-IV

Modern Techniques: Application of Numerical Modeling Techniques to Control Ground Problems of Complex Deposits.

UNIT-V

Use of Modern Instruments for Strata Control of deep seated deposits.
In-situ Gasification and Mineral Biotechnology for Complex Coal Deposits.

TEXT BOOKS:

1. Principles & Practices of Modern Coal Mining, R.D. Singh, New age international New Delhi, 1997.
2. Underground winning of Coal, T.N. Singh, Oxford and IBH New Delhi, 1992.

REFERENCE BOOKS:

1. Longwall mining, Peng S S and Chiang H S, Wiley, New York, 708p.
2. Modern Coal Mining Technology, S.K. Das, Lovely prakashan Dhanbad, 1992.

MN302PC: MINE MECHANIZATION – I

B.Tech. III Sem.

L	T	P	C
3	0	0	3

Pre-Requisites: NIL

Course Objectives: To extract and transport the minerals to the required processing unit/ utilization point variety of machines are used in the mining industry**.** In this course the student gets acquainted with a few machinery including brief details of the machine parts, their working principles, operation and maintenance in addition to the machine installation, commissioning and safety aspects.

Course Outcomes: After going through this course,

1. the student will have basic knowledge of installation, commissioning, operation, maintenance and safety aspects of the mining machinery.
2. different types of rope haulages, mine locomotives, conveyors, laying of rail tracks for rope haulages and locomotives.
3. In addition, gains knowledge of the prime movers for the machinery and power transmission mechanisms.
4. Acquires knowledge of different types of conveyors and able to perform capacity calculations
5. Know about compressed air applications in mines.

UNIT - I

Prime Movers for Mining Machinery: I.C. engines, hydraulic power, pneumatic power, elements of mechanical power transmission, Types of couplings, clutches, brakes, gear drives, belt drives, chain drives-advantages and limitations of each drive

UNIT - II

Rope haulage: Construction of the wire ropes, rope haulages – gravity, direct, balanced direct, main & tail, endless. Suitability of these haulages and their limitations. Dimension of ropes and their calculations, drums and pulleys, care and maintenance of ropes, changing of haulage ropes, rope splicing, safety appliances on haulage road, signaling, Statutory requirements of haulages. Haulage calculations for different types of haulage including gravity type. Electrical layout of haulages. Pit top and pit bottom layouts for rope haulages.

UNIT - III

Track Laying: Rail, joints, crossings, plates, turn tables and curves, track extension,
Aerial Ropeways: Types, construction, operation, Applications, advantages and limitations.

UNIT - IV

Mine Locomotives: Types, constructional features of compressed air, diesel, battery and electric trolley-wire locomotives- operation, application, advantages and limitations. Comparison of various haulages and locomotives. Numerical problems in locomotives.

Conveyors: Belt Conveyors and Chain Conveyors- Types, their installation, operation, shifting, maintenance, applicability and limitations. Vibration and shaking conveyers with their fields of applications.

High angle Conveyors in open cast mines (in brief), Stage loader in long wall mining (in brief). Numerical problems in conveyors.

UNIT - V

Compressed air generation and applications. Types of air compressors, reciprocating and rotary compressors like roots blower, vane type, centrifugal, axial flow, screw type- operation, maintenance, application, advantages and limitations.

Distribution of compressed air, application of compressed air in Mining machinery, maintenance of compressed air, distribution systems

TEXT BOOKS

1. Elements of Mining Technology Vol. III, D.J. Deshmukh
2. Mine Transport – Karelin

REFERENCE BOOKS:

1. Mining and Transport – Walker.
2. Introduction to Mining Engineers – Hartman. H.L.

MN303PC: SURFACE MINING TECHNOLOGY

B.Tech. III Sem.

L	T	P	C
3	0	0	3

Pre-Requisites: NIL

Course Objectives:

1. The objective of this course is to provide students in mining engineering with the necessary knowledge to design safe, efficient and environmentally responsible surface mining operations.
2. To know the various statutory aspects like CMR, MMR and the relevant DGMS circulars related to this course.

Course Outcome: The students will have ability to

1. classify and select the suitable surface mining methods and equipment based on site conditions.
2. Understand layouts and design of surface mines
3. Have a concept of waste dump formations and slope failures in surface mines
4. Learn about ground preparation methods and equipment used for ground preparation
5. Obtain knowledge about excavation systems and transportation systems and numerical problems.

UNIT - I

Introduction: Status of surface mining in India, types of surface mines, applicability and limitations, concept of stripping ratio, stripping economics, concept of ultimate pit limits, design of haul roads, elements of surface mine planning - selection of site for box cut, selection of operating parameters like bench height, width, slope.

UNIT - II

Layout and Design of Surface Mines: Slopes in surface mines – Highwall and waste dumps; Working pit slope and ultimate pit slope, common modes of slope failures, factors influencing stability of slopes, Development of opencast mine layouts for various shapes of deposits. Conversion of Underground mine to opencast mine vis-a vis open cast mine to underground mine related problems and probable solutions.

UNIT - III

Ground Preparation Methods: Preparation of the site – Ripping, Drilling and Blasting; Types, operation, selection, applications and limitations of ground preparation equipments – Rippers, Dozers, Blasthole drills and rock breakers, Determining number of drill machines, dozers and rippers for planned production. Concept of rippability, Blasting in Opencast Mines over Developed Galleries.

UNIT - IV

Excavation System in Surface Mines: Selection criteria for excavation / loading and material transport equipment used in surface mines. Classification, application and limitations of different types of excavating / loading equipment used in surface mining projects; Cycle time and productivity calculation for excavating & loading equipments; Dragline - calculation of required bucket capacity for a given handling requirement, Method and cycle of operations of Draglines, Front end loaders, Scrapers, Bucket wheel and bucket chain excavators, Surface miners. Determining the capacity and number of shovels and dumpers for planned production.

UNIT - V

Transport and Waste Dumps: Scope and application of different modes of transport system in surface mines – Trucks, Synchronization of shovel and dumper capacity for required production; Locomotives; Conveyors (shiftable and high-angle) – mode of operation, applicability and limitations, Scope and application of in-pit crushers in surface mines. Illumination in surface mines.

Types of waste dump – internal and external; dump formation methods and corresponding equipment; Dump stability and stabilisation measures.

TEXT BOOKS:

1. Surface Mining – 2nd Edition, Kennedy, B.A., SME, New York, 1990.
2. Introductory Mining Engineering Hartman H.L, John Wiley and Sons, 2002.

REFERENCE BOOKS:

1. SME Mining Engg. Handbook Vol. I and II, Hartman, H.L. (Ed.), Society for Mining, Metallurgy, and Exploration, Inc., 3rd edition, 2011.
2. Surface Mining, Mishra G.B., Dhanbad Publishers, Dhanbad, 1990.
3. Surface Mining, Pfleider, E. P, 1st Edition, New York, 1968.
4. Open pit Mining Operations, Rzhevsky V., Mir Publications, 1971.
5. Heavy Earth Moving Machinery, Amitosh De, Lovely Prakashan, Dhanbad, 2000.
6. Open Pit Mine Planning & Design, Vol. 1, Fundamentals, Hustrulid, W. and Kuchta, M, Balkema, Rotterdam, 1998.
7. Slope Stability in Surface Mining, Hustrulid, W. A., Mccarter, M. K., And Van Zyl, D. J. A., Ed., Littleton, 2000.
8. Surface Mining Technology, Das, S.K., Lovely Prakashan, Dhanbad, 1994.

MN304PC: MINE HAZARDS AND RESCUE

B.Tech. III Sem.

L	T	P	C
2	0	0	2

Pre-Requisites: NIL

Course Objectives: To introduce causes of mine fires, advances in more lighten technology, explosion causes of, mine inundation etc.

Course Outcomes: After going through this course, the student will

1. have knowledge about different Rescue apparatus and their applications.
2. Gain knowledge on assessment and control of hazard due to mine fires, inundations, mine dust etc.,
3. Learn about Operation and maintenance of different firefighting equipment and preventive measures for different mine hazards.
4. Know about dealing with waterlogged bodies and designing dams and sumps.
5. Acquires knowledge on handling of flame safety lamp and illumination standards for opencast and underground workings.

UNIT - I

Mine fires: Classification, surface and underground fires, causes and effect of mine fires, spontaneous combustion, causes and nature of spontaneous combustion, its detection and prevention. Firefighting equipment: selection installation, operation and maintenance in mines. Firefighting organization, sealing of fire areas, re-opening of sealed off areas.

UNIT - II

Explosions: Classification of explosions, causes of underground explosions, Fire damp explosions: causes and preventive measures, Coal dust explosions, Explosibilty of coal dust, causes and preventive measures to be taken against coal dust explosions, water gas explosion.

UNIT - III

Inundation: Causes of mine inundations from surface and underground sources, precautionary and productive measures on surface and in underground, Approaching water logged areas and dewatering of water logged areas. Design of various water dams, sump and pumps.

UNIT - IV

Rescue and recovery work: Mine rescue and first aid equipment, short distance apparatus, self-contained oxygen breathing apparatus, self-rescuers, reviving apparatus, rescue stations, organization, rescue and recovery work in connection with fires, explosions and inundations. Basic principles of risk management. Dust in mine air: dust production in mines and its control, health hazards, sampling and assessment of airborne dust.

UNIT - V

Mine illumination: Standards of illumination, common types of flame safety lamps, their use and limitations, electric hand and cap lamp, their maintenance and examination, lamp room design and organization. Illumination arrangements of opencast and underground workings.

TEXT / REFERENCE BOOKS:

1. Mine Fires explosions, rescue, recovery and illuminations, Ramulu MA.
2. Fires in coal mines, Kaku.
3. Elements of Mining Technology, Vol.-I, DJ Deshmukh.

MN305PC: MINE MECHANIZATION- I LABORATORY

B.Tech. III Sem.

L	T	P	C
0	0	2	1

Pre-Requisites: NIL

Course objectives: To impart knowledge to students about:

1. Construction as operations of various types of engineer, mining equipment etc.
2. Testing procedure for determination of various properties of mining machinery like efficiency, strength friction etc.

Course outcomes: The students will be able to

1. Determine the angle of friction and coefficient of friction.
2. Explain the working of screw jack, calculate efficiency and constructional features of engine models
3. Evaluate the properties of different mining machinery components
4. Perform test on reciprocating air compressor
5. Study the characteristics of different machinery components.

LIST OF EXPERIMENTS

1. To find out the angle of friction for different materials.
2. Coefficient of friction between belt / rope and pulley
3. Determination of Efficiency of a screw jack
4. Study of construction and operation of 4stroke SI engine model.
5. Study of construction an d operation of 4 stroke CI engine model.
6. Performance testing of a 4 stroke Diesel engine.
7. Performance test of reciprocating air compressor
8. Study of different types of gear and gear trains.
9. To study the construction of multi-speed gearbox used in dozer.
10. Study of rope brake dynamometer.
11. Study of different types of couplings.
12. Study of multiple clutches
13. To study the jump phenomena of Cam and Follower
14. To study the dynamics of governor.

MN306PC: MINE HAZARDS AND RESCUE LABORATORY

B.Tech. III Sem.

L	T	P	C
0	0	2	1

Pre-Requisites: NIL

Course outcomes:

1. The students will have knowledge on different types of breathing apparatus.
2. The students will able to perform test to determine the flammability temperature, noise level and illumination.
3. The students will able to understand construction and working of explosion proof fire stopping
4. The students will acquire knowledge on usage of soil test kit and dust samplers.

LIST OF EXPERIMENTS

1. Study of MSA type gas mask i) Filter type apparatus ii) Self Rescue.
2. Study of self-contained breathing apparatus i) Drager BG-174 ii) By Travox -120
3. Study of Drager pulmotor (Model:PT-60)
4. Estimation of SPM concentration in air using high volume sampler.
5. Study of construction and working of explosion proof fire stopping.
6. Determination of flammability temperature of coal.
7. Determination of nutrient status in soil using soil test kit.
8. Measurement of Noise level by integrated sound level meter.
9. Measurement of Lux by light meter.
10. Air born dust modeling.

MN411OE: INTRODUCTION TO MINING TECHNOLOGY (Open Elective - I)

B.Tech. IV Sem.

L	T	P	C
3	0	0	3

Pre-Requisites: NIL

Course Objectives: The student is expected to learn the fundamentals of mining engineering so as to encourage multi-disciplinary research and application of other branches of engineering to mining technology.

Course Outcomes: Upon completion of the course, the student shall be able

1. To acquire the knowledge of formation and distributions of mineral deposits.
2. To get exposure of different stages of mining operation.
3. Obtain the knowledge of various mining methods adopted for extraction of mineral deposits.
4. Understand the various drilling techniques and explosives being practiced in mines
5. Learn about different types of access making techniques to mineral deposits.

UNIT-I

Introduction: Distribution of mineral deposits in India and other countries, mining contributions to civilization, mining terminology,

UNIT-II

Stages in the life of the mine - prospecting, exploration, development, exploitation and reclamation. Access to mineral deposit- selection, location, size and shape (incline, shaft and adit), brief overview of underground and surface mining methods.

UNIT-III

Drilling: Types of drills, drilling methods, electric, pneumatic and hydraulic drills, drill steels and bits, drilling rigs, and jumbos.

UNIT-IV

Explosives: Classification, composition, properties and tests, fuses, detonators, blasting devices and accessories, substitutes for explosives, handling and storage, transportation of explosives.; Rock blasting: Mechanism of rock blasting, blasting procedure, and pattern of shot holes.

UNIT-V

Shaft sinking: Ordinary and special methods, problems, and precautions, shaft supports and lining.

TEXT BOOKS:

1. Rock blasting effect and operation, R. P. Pal, A. A. Balkema, 1st Ed, 2005.
2. Elements of mining technology, Vol. 1, D. J. Deshmukh, Central techno, 7th Ed, 2001.

REFERENCE BOOKS:

1. Drilling technology handbook, C. P. Chugh, Oxford and IBH, 1st Ed, 1977.
2. Principles and practices of modern coal mining, R. D. Singh, New age international, 1st Ed, 1997.

MN412OE: UNDERGROUND COAL GASIFICATION (Open Elective - I)

B.Tech. IV Sem.

L	T	P	C
3	0	0	3

Pre-Requisites: NIL

Course Objectives: To specialize the students with additional knowledge on geological and technological factors of coal gasification industry mining methods of underground coal gasification, linkage techniques etc.

Course Outcomes:

1. Student can get specialized in the underground coal gasification (UCG) concepts, application and future scope in various geo-mining conditions.
2. Student will learn about underground coal gasification process component factors and able to understand opening of coal seams to implement UCG method.
3. Student will learn about various mining methods of UCG.
4. Student will learn about various non-mining methods of UCG.
5. Student will learn about various linkage techniques during development of UCG.

UNIT - I

Underground Coal Gasification (UCG) Concept; Chemistry, conditions suitable for UCG, Principles of UCG., Merits and Demerits.

UNIT - II

UCG Process Component factors: Technology of UCG, opening up of coal seam for UCG.

UNIT - III

Mining methods of UCG: Chamber method, Stream method, Borehole procedure method, Blind bore hole method.

UNIT - IV

Non-Mining methods of UCG: Level seams, Inclined seams.

UNIT - V

Linkage Techniques: Percolation linkage, Electro linkage, Boring linkage, compressed-air-linkage, Hydraulic fracture linkage. Future Scope and Development: Innovations.

TEXT BOOKS:

1. Underground Coal Mining Methods – J.G. SINGH
2. Winning and Working Coal in India Vol. II- R.T. Deshmukh and D.J. Deshmukh.

REFERENCE BOOK:

1. Principles and Practices of Modern Coal Mining – R.D. SINGH.

MN411PE: COMPUTER APPLICATIONS IN MINING (Professional Elective - II)

B.Tech. IV Sem.

L	T	P	C
3	0	0	3

Pre-Requisites: NIL.

Course Objectives:

1. To impart knowledge on hardware and software issues concerned with computers in mining industry.
2. To develop algorithms and programs on various mining related problems
3. To impart knowledge on high-end simulation methodologies
4. To study modern techniques on solving mining problems.

Course Outcome: The students will have

1. Basic programming knowledge and its applications on various mining related applications.
2. Familiarity with hardware and software issues during development of programs.
3. Knowledge on stability analysis and ventilation network analysis in coal and metal mines
4. A perspective on high-end simulation methodologies and modern techniques to solve mining problems.

UNIT - I

Algorithm, flow charts and Programming of mining application like pillar design, blast design, subsidence.

UNIT - II

Design of the mine entries such as Incline, Shaft, Decline and Adit. Stability analysis and design of coal pillars, coal panels, stope pillars and barriers.

UNIT - III

Subsidence prediction: Longwall, Continuous miner, Board and Pillar, Cut & Fill method and Shrinkage stoping.

UNIT - IV

Stability analysis and design of high walls, production fronts, dumps of opencast coal mine and metal mines.

UNIT - V

Development of ventilation network for Bord & Pillar, longwall, Continuous miner in coal and metal mine methods. Network analysis for the emerging mining methods. Design of the mine fan capacity.

TEXT BOOKS:

1. Computer Applications in the Minerals Industries, Kadri Dagdelen, Editor, Colorado School of Mines, 1999.
2. Computers in Mineral Industry, Ramani R.V., et al. Oxford and IBH Publishers, 1994.

REFERENCE BOOKS:

1. APCOM Proceedings Application of Computers and Operations, R. V. Ramani – Editor, Research in the Mineral Industry, The Society of Mining, Metallurgy and Exploration, Inc., 1996.
2. Computers Applications in Mineral Industry, Fytas, K. and Singhal, R. K. A. A. Balkema Publication, 1988.
3. Fundamentals of Computers, E Balagurusamy, Mc Graw Hills Publication, 2009.
4. Computers Today Fourth Edition, Basandra S K, Galgotia Publications Pvt. Ltd, 2004.

MN412PE: ADVANCED SURVEYING (Professional Elective - II)

B.Tech. IV Sem.

L	T	P	C
3	0	0	3

Pre-Requisites: Mine Surveying

Course Objectives: The objective of this course is to impart knowledge on the different surveying techniques to be selected for special scenarios faced in the mines.

Course Outcome: On Completion of the course, the students will be able to:

1. Execute the dip and fault problems.
2. Conduct survey for different stopes in mines
3. Perform survey in mines using plane table surveying method.
4. Design the mine plans by using various methods.
5. Conduct survey for identifying joints, boreholes in the mines.

UNIT - I

Dip and Fault Problems: Dip and Strike, Cross measure drift problems, true or stratigraphical thickness of a seam, Determination of rate and direction of full dip of a seam after sinking, Direction and amount of dip from boreholes, Fault problems.

UNIT - II

Stope Surveying: Purpose of stope surveying, Classification of stop surveying methods, Tape triangulation method, Ray method. Stope surveying in mines worked by shrinkage stoping, Stope surveying in moderate inclination.

UNIT - III

Plane table survey: Accessories, working operation, precise plane table equipment, methods of plane tabling, radiation, intersection (graphic triangulation), traversing, resection, three point problem, two point problem, adjustments, errors, advantages and disadvantages.

UNIT - IV

Mine Plans & Theory of Errors: Various methods of plotting survey, survey office, storage of survey instruments, scales and its classifications. kinds of errors, definitions, laws of accidental errors, probability curve, probable errors of an average, probable error of sum, most probable value, mean square error, average error, general principle of least squares, law of weights, determination of probable errors, distribution of error of the field measurement, determination of most probable values.

UNIT - V

Setting Out & Miscellaneous Survey: Ensuring coincident verticality of pillars, Joint surveying, Plans and sections of opencast project, Surveying work for locating boreholes for dewatering, Error in marking point for borehole, survey work for installing headgear.

TEXT BOOKS:

1. Surveying Vol. I & II, B. C. Punmia, Laxmi Publication.
2. Mine Surveying Vol. I, II & III, S. Ghatak, Coal Field Publishers.

REFERENCE BOOK:

1. Surveying Vol. I, S. K. Duggal, Tata McGraw Hill Publications, New Delhi.

MN413PE: MATERIAL MANAGEMENT IN MINES (Professional Elective - II)

B.Tech. IV Sem.

L	T	P	C
3	0	0	3

Pre-Requisites: NIL

Course Outcomes: Students will

1. Gain Knowledge on importance of material management and different methods.
2. Understand material planning and purchase system.
3. understand store accounting, stock verification and value analysis.
4. Gain knowledge in inventory management.
5. Get to know about rules, regulations and acts of material management.

UNIT – I:

Introduction: Introduction to material management, importance of integrated materials management, need for integrated materials management concept, definition, scope and advantage – an overview, A-B-C analysis, codification, variety reduction, standardisation.

UNIT – II:

Purchasing Management: Material planning and purchase, purchase system, procedures, price forecasting, purchasing of capital equipment, vendor development, account procedure, purchasing decisions, procurement policies.

UNIT – III:

Warehousing and Store Management: Store keeping principles – past and latest techniques, stores – general layout, cost aspect and productivity, problems and development, store system procedures, incoming material control, store accounting and stock incoming material control, store accounting and stock verification, value analysis.

UNIT – IV:

Inventory Management: Introduction, basic models, definitions of commonly used terms, replenishment model, choice of systems, etc., inventory work in progress, safety stock, computerisation in materials management, control, information to materials management case study, spare parts management.

UNIT – V:

Material Procurement Procedures: Arbitration Act – Octroi, central and local sales tax, excise duties – customs tariff, import control policies, procurement from govt, agencies and international market - insurance, DGS and D tariff.

TEXT BOOKS / REFERENCE BOOKS:

1. Material Management: An Integrated Approach, Goplakrishnan, P, and Sundaresan, M. Prentice Hall of India Pvt Ltd., New Delhi, 1982.
2. Materials Management procedure, Test and cases, Datta, A.K., Prentice Hall of India Pvt Ltd., New Delhi 1984.
3. Effective Materials Management, Peckam, H.H., prentice Hall of India Pvt Ltd., 1984.
4. Modern Inventory Management, Prichard, J.W., and Eagle, R.H. N, Y., Wiley and Breach Science Publishers, 1972.

MN401PC: MINE MECHANIZATION - II

B.Tech. IV Sem.

L	T	P	C
3	0	0	3

Pre-Requisites: NIL

Course Objectives: This is the second paper in the mine mechanization course. In the previous paper a few machinery working in the mining industry were introduced to the student. In this paper some more machines like winders in deep mines, opencast mine machinery and mine pumps are introduced.

Course Outcomes: After going through this course the student will

1. Have the basic knowledge of installation, commissioning, operation, maintenance and safety aspects of the mining machinery.
2. Gain information on Different types of mine winders such as koepe and drum winders.
3. Understand constructional feature and applications of man riding systems in underground mines and about different types of cutter loaders
4. Acquire knowledge of different types of face machinery like SDL, LHD, Continuous miners, mine pumps etc., used in mechanised and semi-mechanised mines.
5. Know about open cast mine machinery like Blast hole drills, shovels, dragline machine, BWE, dumpers etc., and their capacity calculations.

UNIT - I

Mine Winders: Koepe and Drum winders and their applications, head gear, head gear pulley, shaft fitting – Keps, rope guides, shaft sinking and bells, capping and recapping and its design, cage and suspension gear. Pit top and pit bottom lay only. Pit top railway ridings.

UNIT - II

Winding Drum-types and construction, Safety devices in winders-over speed and over wind preventers, slow braking, depth indicator, Methods of counter balancing rope. Duty cycle. Mechanical and electrical braking. Winding from different levels in shaft. Numerical problems in different types of winding including Torque – time diagrams.

UNIT - III

Man riding system in underground mines. Face Machinery: SDL, LHD, Shuttle cars, underground trucks different types of mechanical loaders – their constructions, operation, applications, capacity and maintenance.

Cutter loaders – Shearers, Coal plough and Continuous Miners – their constructional features, applications, capacity and maintenance; Hydraulic power pack. Maintenance of equipment including preventive maintenance and condition monitoring. Hydraulic layouts of Longwall focus.

Introduction to automation: construction and operation of coal drill and Jack hammer.

UNIT - IV

Power loader (Mechanical loader), Shuttle cars: their constructions, operation, applications, capacity and maintenance.

Pumps: Sources of water in mines, design of sumps, types, Construction, operation, characteristics and application, Calculation of size, efficiencies and capacities. Layout of drainage system.

UNIT - V

Opencast Machinery: Blast Hole Drill, Ripper, front and loaders, dozers, road grades, Shovel, rock breakers, water tankers, Dragline, Dumper, including machinery and tracker, Bucket Wheel Excavator, Surface Miners. – their basic construction, applications and operation.

TEXT BOOKS:

1. Elements of Mining Technology. Vol. I & II, Deshmukh D.J.,
2. Pumps & Compressors, Cherkasky B.M.
3. Winding & Transport, Walkar.

REFERENCE BOOKS:

1. Mine Mechanisation and Automation – Alemgren, G. Kumar
2. Coal Mining Series. – Mason.

MN402PC: UNDERGROUND METAL MINING TECHNOLOGY

B.Tech. IV Sem.

L	T	P	C
3	0	0	3

Pre-Requisites: NIL

Course Objectives:

1. To introduce concepts of metal mining and metal mining terminology.
2. To study development and operations of metal mines.
3. To study about special methods of metal mining methods.
4. To know the various statutory aspects like CMR, MMR and the relevant DGMS circulars related to this course.

Course Outcomes:

1. The students will have basic concept on metal mining methods, classification of mining methods and selection of appropriate method
2. Learn about mine design, development and operations of metal mines and production scheduling.
3. They will also know about techno-economical parameters effecting stopes and design of stopes for optimum production
4. Understand about parameters effecting selection of equipment and learns about organisation of metal mines
5. They will also know about novel methods of metal mining and its applications.

UNIT - I

Basics: Metal Mining Terminology; Typical modern metal mine features; exploration, estimation of block wise and mine wise reserves and actual production, typical pre-stoping ore block constructional features; classification of mining/ stoping methods;

UNIT - II

General Mine Design: Mode of mine and stope entry; Layouts; Determination of optimum production level; sequence of extraction, production scheduling; Basic design – Level Intervals, ore pass, common ore pass, size of blocks ore handling in stope and other openings, overview of constructional features – X cuts, Raises, Winzes etc.

UNIT - III

Stoping – General Concepts: Techno-economic characteristics impacting choice of method; typical unit cost parameters; optimum size of a mine and stope. stope layout, design, equipment selection; preparing a stoping block; sequence of stoping; organization; production cycle; unit cost calculation; comparison of methods and costs

UNIT - IV

Stoping Methods: Unsupported methods – Stope and pillar, room and pillar, shrinkage, sublevel stoping etc. supported stoping– cut and fill, stull, square set, rill, etc. caving methods – Top slicing, sublevel
caving, block caving. case studies of Indian and foreign underground metal mines. comparison of various methods of stoping and costs.

UNIT V

Novel & Innovative Techniques and Special Applications: Hydraulic mining, slurry mining, solution mining, nuclear mining; Rapid excavation; Radial – axial splitter; Thermal fragmentation; shock wave breaking; Deep mining; narrow contiguous veins; shaft and remnant pillars; VCR; Ring drilling; Large Blast hole stoping.

TEXT BOOKS:

1. Introductory Mining Engineering, Hartman, H.L., John Wiley and Sons, New York, 1987.
2. Underground Mining Methods Handbook Society of Mining Engineering, Hustrulid, W.A. Ed., AMIE, New York, 1990.

REFERENCE BOOKS:

1. Gold mining in Witwatersrand, The Transvaal chamber of mines, Volume I, II, BICCARD J C, 1946
2. SME Mining Engineering Handbook, 3rd edition, Vol I & II, Hartman, H. L. (Editor), Society of Mining Engineers, New York, 2011.

MN403PC: MINE MECHANIZATION - II LAB

B.Tech. IV Sem.

L	T	P	C
0	0	2	1

Pre-Requisites: NIL

Course objectives: To impart knowledge to students about:

1. Construction as operations of various types of engineer, mining equipment etc.
2. Testing procedure for determination of various properties of mining machinery like efficiency, strength friction etc.

Course outcomes: After this course, students will able to

1. Describe the constructional details of various mining equipment.
2. Explain the working of mining machinery.
3. Develop different hydraulic circuits and perform investigations of hydrostatic transmission
4. Develop different types of pneumatic circuits and acquire details of jack hammer drill
5. Study about the details of different types of pumps used in mines and determine fatigue strength and breaking strength of steel wires

LIST OF EXPERIMENTS

1. Study of gate end box
2. Study of drill panel and handheld in a drill
3. Study of mining type electric cable.
4. Study of pillar switch
5. To develop different hydraulic circuits in hydraulic trainer.
6. To study the construction and operation of hydraulic pumps, motors and valves
7. To study the construction and operation of hydraulic fittings and hoses.
8. Performance investigation of hydrostatic transmission systems with different motors.
9. To develop different pneumatic logic circuits in pneumatic trainer
10. Performance test of centrifugal pumps
11. Performance test on reciprocating pump
12. Dismantling and assembly of Jack Hammer Drill machines
13. Determination of fatigue strength of steel wires
14. Determination of Breaking strength of steel wire ropes

EN405HS: ADVANCED ENGLISH COMMUNICATION SKILLS LABORATORY

B.Tech. IV Sem. **L T P C**
0 0 2 1

1. Introduction

The introduction of the Advanced English Communication Skills Lab is considered essential at the B.Tech 3rd year level. At this stage, the students need to prepare themselves for their career which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use appropriate English and perform the following:

1. Gathering ideas and information to organise ideas relevantly and coherently.
2. Making oral presentations.
3. Writing formal letters.
4. Transferring information from non-verbal to verbal texts and vice-versa.
5. Writing project/research reports/technical reports.
6. Participating in group discussions.
7. Engaging in debates.
8. Facing interviews.
9. Taking part in social and professional communication.

2. Objectives:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, with a focus on vocabulary
- To enable them to listen to English spoken at normal conversational speed by educated English speakers
- To respond appropriately in different socio-cultural and professional contexts
- To communicate their ideas relevantly and coherently in writing
- To prepare the students for placements.

3. Syllabus:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. **Activities on Listening and Reading Comprehension:** Active Listening – Development of Listening Skills Through Audio clips - Benefits of Reading – Methods and Techniques of Reading – Basic Steps to Effective Reading – Common Obstacles – Discourse Markers or Linkers - Sub-skills of reading - Reading for facts, negative facts and Specific Details- Guessing Meanings from Context, Inferring Meaning - Critical Reading –– Reading Comprehension – Exercises for Practice.
2. **Activities on Writing Skills**: Vocabulary for Competitive Examinations - Planning for Writing – Improving Writing Skills - Structure and presentation of different types of writing – Free Writing and Structured Writing - Letter Writing –Writing a Letter of Application –Resume vs. Curriculum Vitae – Writing a Résumé **–** Styles of Résumé - e-Correspondence – Emails – Blog Writing - (N)etiquette – Report Writing – Importance of Reports – Types and Formats of Reports– Technical Report Writing– Exercises for Practice.
3. **Activities on Presentation Skills -** Starting a conversation – responding appropriately and relevantly – using the right language and body language – Role Play in different situations including Seeking Clarification, Making a Request, Asking for and Refusing Permission, Participating in a Small Talk – Oral presentations (individual and group) through JAM sessions- PPTs – Importance of Presentation Skills – Planning, Preparing, Rehearsing and Making a Presentation – Dealing with

Glossophobia or Stage Fear – Understanding Nuances of Delivery - Presentations through Posters/Projects/Reports – Checklist for Making a Presentation and Rubrics of Evaluation

4. **Activities on Group Discussion (GD):** Types of GD and GD as a part of a Selection Procedure - Dynamics of Group Discussion- Myths of GD - Intervention, Summarizing - Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas **–** Do's and Don'ts - GD Strategies – Exercises for Practice.
5. **Interview Skills**: Concept and Process - Interview Preparation Techniques - Types of Interview Questions – Pre-interview Planning, Opening Strategies, Answering Strategies - Interview Through Tele-conference & Video-conference - Mock Interviews.

4. Minimum Requirement:

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- One PC with latest configuration for the teacher
- T. V, a digital stereo & Camcorder
- Headphones of High quality

5. Suggested Software: The software consisting of the prescribed topics elaborated above should be procured and used.

- **TOEFL & GRE** (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- **Oxford Advanced Learner's Dictionary**, 10th Edition
- **Cambridge Advanced Learner's Dictionary**
- **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider**, by Dreamtech

6. Books Recommended:

1. Rizvi, M. Ashraf (2018). *Effective Technical Communication*. (2nd ed.). McGraw Hill Education (India) Pvt. Ltd.
2. Suresh Kumar, E. (2015). *Engineering English.* Orient BlackSwan Pvt. Ltd.
3. Bailey, Stephen. (2018). Academic *Writing: A Handbook for International Students.* (5th Edition). Routledge.
4. Koneru, Aruna. (2016). *Professional Communication*. McGraw Hill Education (India) Pvt. Ltd.
5. Raman, Meenakshi & Sharma, Sangeeta. (2022). *Technical Communication, Principles and Practice.* (4TH Edition) Oxford University Press.
6. Anderson, Paul V. (2007). *Technical Communication***.** Cengage Learning Pvt. Ltd. New Delhi.
7. McCarthy, Michael; O'Dell, Felicity & Redman, Stuart. (2017). *English Vocabulary in Use* Series. Cambridge University Press
8. Sen, Leela. (2009). *Communication Skills.* PHI Learning Pvt Ltd., New Delhi.
9. Elbow, Peter. (1998). *Writing with Power.* Oxford University Press.
10. Goleman, Daniel. (2013). *Emotional Intelligence*: *Why it can matter more than IQ.* Bloomsbury Publishing.

MN521OE: HEALTH AND SAFETY IN MINES (Open Elective - II)

B.Tech. V Sem.

L	T	P	C
3	0	0	3

Pre-Requisites: NIL

Course Objectives: To brief mining students in health and safety engineering concepts, causes of accident, training, human behavioural approach in safety etc.

Course Outcomes: Student will able to

1. Gain knowledge and able to understand the importance of health and safety including the role of safety risk assessment in mining industry
2. Acquire knowledge about accidents, classification of accidents, accident analysis and report preparation
3. Learn identification of causes of hazards and able to implement preventive measures
4. Learn about safety analysis and loss control operations such as ZAP, MAP etc.
5. Use risk minimization techniques and risk analysis techniques FTA, HAZOP, ETA etc.

UNIT - I

Introduction to accidents, prevention, health and safety in industry: Terminology, reason for preventing accidents – moral and legal.

Safety scenario in Indian mines, Accidents in Indian mines, Measurement of safety performance. Classification of accidents as per Mining legislation/law and general classification of accidents.

UNIT - II

Causes and preventive measures of accidents in underground and opencast mines i.e., due to fall of roof and sides, transportation of machinery, haulage and winding, drilling and blasting, movement of machinery in opencast mines and electricity etc., ; accident analysis and report, cost of accidents, statistical analysis of accidents and their importance for promotion of safety.

UNIT - III

System engineering approach to safety, techniques used in safety analysis, generic approach to loss control within mining operations. Concept of ZAP and MAP.

UNIT - IV

Risk management, Risk identification, Risk estimation and evaluation, Risk minimization techniques in mines. Risk analysis using FTA, HAZOP, ETA etc; health risk assessment and occupational diseases in mining.

UNIT - V

Development of safety consciousness, publicity and propaganda for safety; training of workmen, Human Behavioral approach in safety, safety polices and audio-visual aids, safety drives campaigns, safety audit. Safety management and organization; Internal safety organization.

TEXT BOOKS:

1. Occupational Safety and Health in Industries and Mines by C.P. Singh
2. Mine Safety and Legislation. S.K. Das, Lovely Prakashan, Dhanbad, 2002

REFERENCE BOOKS:

1. System Safety Engineering and Risk Assessment: A Practical Approach, N.J. Bahr, Taylor and Francis, NY, 1997.
2. Indian Mining Legislation – A Critical Appraisal by Rakesh & Prasad.

MN522OE: MATERIAL HANDLING IN MINES (Open Elective - II)

B.Tech. V Sem.

L	T	P	C
3	0	0	3

Pre-Requisites: NIL

Course Objectives:

1. To introduce the basic principles in material handling and its equipment
2. To study the conveyor system and its advancement

Course Outcomes: The students will

1. Get exposure towards the material handling methods and systems and its principle to convey the minerals or materials from mines, plants and workshops.
2. Know about principles in material handling, classification of material handling equipment's and current material handling systems in world and Indian scenario.
3. Gain knowledge about different conveying systems used in mines.
4. Get details of different types of belt conveyors, its components and capacity calculations
5. Understand about bulk material management in mines.

UNIT - I

Bulk Handling Systems: Basic principles in material handling exclusive to mining industry and its benefits. Classification of material handling equipments. Current state of art of bulk handling materials in mining in the world and Indian scenario; Selection of suitable types of systems for application. Stacking, blending, reclaiming and wagon loading, machinery and systems used at the stack yards; stock piles, silos, bunkers – their design, reclamation from them, various types of weigh bridges. Segregation - size wise and grade wise, Railway sidings.

UNIT - II

Short Conveyors and Haulage Systems: Roller conveyor, overhead conveyor, screw conveyor, auger conveyor, apron feeder, bucket elevators, scraper haulage, conveyors in steep gradient, Armoured face conveyor, Off-highway Trucks, haul roads, In-pit crushers and modular conveyors, electric trolley assisted haulage, shuttle cars, skip hoist, winders, LHD's, pneumatic conveying, hydraulic transport.

UNIT - III

Belt Conveyor System: Design, capacity, calculations with respect to the size, speed, troughing, power requirement, tension requirement, belt selection, factor of safety; developments in the design, of various components of belt conveyor systems such as; structures, rollers, gear boxes and motors, drums and pulleys, belting, ancillary components and safety gadgets.

UNIT - IV

New Types of Belt Conveyor Systems: Curved conveyors, cable belts, pipe conveyors, rock belts – mine-run-rock conveyor, steel belt conveyors, steel slot conveyor, chain belt conveyors, etc., and other new developments, stackers and reclaimers, High Angle Conveyors (HAC); New inventions in HAC , Mobile or fixed installations; Woven wire belts, En Masse conveyor, Vibrating conveyor, gravity bucket conveyor.

UNIT - V

Material Handling in Mines, Plants and Workshops: Mobile cranes, derrick cranes, pillar cranes, tower cranes, radial cranes, bridge cranes, fork lifters, over head gantry material handling in workshops. Mineral handling in dimensional stone quarries, Mineral handling plants(coal, etc.,) Locomotives, rail tracks, rail cars, railways wagons; Aerial ropeways, gravity ropeways; Containers and shipping; Rope haulage - different types.

TEXT BOOKS:

1. Material Handling – Principles and Practices, Allegri (Sr.), T.H.,CBS Publishers and Distributors, Delhi, 1987.
2. Open Pit Mine Planning & Design, Vol. 1, Fundamentals, Hustrulid, W., and Kuchta, M. Balkema, Rotterdam, 1998.

REFERENCE BOOKS:

1. Surface Mining – 2nd Edition, SME, Kennedy, B.A., New York, 1990.
2. Elements of Mining Technology, Vol.I, II and III, Deshmukh, D.J., EMDEE Publishers, Nagpur, 1979.
3. Longwall Mining, Peng, S.S., and Chiang, H.S., John Wiley and Sons, New York, 1984.
4. Mining Engg. Handbook Vol.I and II, Hartman, H.L., (Ed.), SME Society for Mining, Metallurgy, and Exploration, Inc., Colorado, 1992.
5. Advanced coal Mining, Vol. I and II, Vorobjev, B.M., and Deshmukh, R.T. Mrs Kusum Deshmukh, P.O. Indian School of Mines, 1966.
6. Methods of Mining, Working, Coal and Metal Mines, Vol.II and III, Woodruff, S.D., Pergamon Press, 1968.
7. Winding and Transport in Mines, Sinclair, J., Sir Isaac Pitman and Sons, Ltd., London, 1959.

MN511PE: RISK ASSESSMENT AND MANAGEMENT (Professional Elective – III)

B.Tech. V Sem.

L	T	P	C
3	0	0	3

Pre-requisites: Under graduate Physics and Mathematics.

Course Objectives: Upon completion of the course, the students shall be able to know the components of safety risk assessment, Epidemiological studies along with safety audit and management in mines

Course Outcomes:

1. To understand the terminology and reason for preventing accidents, components of Risk Assessment.
2. To learn about concepts of risk assessment and understand qualitative and quantitative approaches based on accident trends in mining industry
3. To have insight in to components of risk assessment such as risk identification, estimation and evaluation etc.
4. To perform epidemiological studies.
5. Apply the Safety Policies, Safety Audit and Safety Management in Mines along with Case studies

UNIT - I

Introduction to Accident Prevention and Health & Safety in Industry: Terminology, Reason for preventing accidents – moral, cost, legal.

UNIT - II

Accident statistics and trends in mining industry; Risk Assessment techniques: Concepts, Qualitative and Quantitative Approaches;

UNIT - III

Components of Risk Assessment: Risk Identification, Risk Estimation and Evaluation; Risk Analysis using WRAC (Workplace Risk Assessment and Control) FTA, HAZOP, ETA, Risk Analysis Softwares; logun for ETA &FTA available for fire. Risk Minimization Techniques in Mines;

UNIT - IV

Epidemiological Studies; Statistical and Economic Analysis of Accident Data; Behavior based safety approaches.

UNIT - V

Application of Virtual Reality for Safety, Training and Marketing; Case studies on Safety Risk Assessment in Mining and allied industries.

TEXT BOOKS:

1. Safety in Mines, B. K. Kejriwal, Lovely Prakashan, Dhanbad, 2002.
2. System Safety Engineering and Risk Assessment: A Practical Approach, N. J. Bahr, Taylor and Francis, NY, 1997.

REFERENCE BOOKS:

1. Accident Prevention and Safety Management in Mines, A. Bhattacharya, Short Term Course, Nov. 30-3rd Dec., 2004, IIT, Kharagpur, 2004.
2. Hazard Analysis Techniques for System Safety, A. Clifton, Ericson II, John Wiley & sons, New Jersey, Canada, 2005.

MN512PE: ROCK FRAGMENTATION ENGINEERING (Professional Elective – III)

B.Tech. V Sem.

L	T	P	C
3	0	0	3

Pre-Requisites: NIL

Course Objectives: To familiarize the students

1. With highly specialized subject of design of rock breaking techniques
2. With more emphasis on computational models,
3. Different controlled blasting techniques.
4. Required instrumentation for monitoring blasting operations in mines.

Course Outcomes: Although shot firer supervise the drilling and blasting operation statutorily in any mines, students are expected to have detailed knowledge on rock fragmentation techniques. This course enables the student

1. To have clear perception of rock fragmentation techniques and its field applications.
2. To understand the general theories of rock cutting and to select appropriate cutting tools.
3. To acquire knowledge of mechanism involved in rock fragmentation and explosive action.
4. To use different types of computational models to design blast patterns and control blasting techniques to prevent adverse effects of blasting
5. To use modern tools and instruments in rock fragmentation.

UNIT - I

General theory of rock cutting, selection of cutting tools for optimum penetration and wear characteristics.

Mechanics of rotary, percussive and rotary-percussive drilling, short and long hole drilling equipment, different types of bits, bit wear, drilling in difficult formations, drill ability of rocks, drilling performance and cost of drilling; specific energy in drilling, Pneumatic and Hydraulic rock hammers.

UNIT - II

Mechanics of rock fragmentation and fracture by explosive action, Types of explosives, blasting accessories, blasting parameters, design of blasting rounds for opencast and underground mines, Blast ability of rocks, blasting efficiency, mean fragment size.

UNIT - III

Computational models of blasting, transient ground motion, misfires, blown out shots, incomplete detonation – their cases and remedial measures.

UNIT - IV

Controlled blasting techniques, perimeter blasting, safety precautions, ground vibrations and air over pressure from blasting.

UNIT - V

Instrumentation in blasting, Borehole pressure transducer, V.O.D probe, vibration monitor, high speed video camera. Impact of ground vibration and sound on the neighboring structures and communities, and mitigate measures.

TEXT BOOKS:

1. Rock Blasting effect and operation, P. Pal Roy A A Barkolna 2005
2. Explosive and Blasting Practices in Mines S. K. Das, Lordy Prakashan, 1993

REFERENCE BOOKS:

1. Blasting Operation, B. H. Garg, McGraw Hill, 1981
2. Drilling Technology Handbook, CP Chugh, Oxford & IBH, 1977

MN513PE: ADVANCED SURFACE MINING (Professional Elective – III)

B.Tech. V Sem.

L	T	P	C
3	0	0	3

Pre-Requisites: NIL

Course Objectives:

1. To introduce the various techniques for mine planning, geotechnical investigation and equipment management.
2. To appreciate the modern trends in opencast mines, safety and environment

Course Outcomes: The students will

1. Have insight about the advanced techniques for surface mine planning and production scheduling.
2. Able to perform geotechnical investigation on parameters influencing slope stability and influence of pit slope on mine economics
3. Understand production and equipment planning and management.
4. Get knowledge on occupational health hazards due to mine dust and mine environment
5. Know about the modern trends in opencast mines, safety and environment.

UNIT - I

Pit Planning: Development of economic block model; Pit cut-off grade and its estimation; Ultimate pit configuration and its determination – hand method, floating cone technique, Lerchs-Grossmann algorithm(2D&3D), and computer assisted hand method. Addition of haul road on pit plan; Pit layouts. Open-pit optimisation techniques for mine geometry and output, mine development phases, quality control Output and manpower planning; calendar planning, mine scheduling, production scheduling, truck dispatch system; Feasibility Report, DPR-contents and preparation.

UNIT - II

Geotechnical Parameters: Influence of pit slope on mine economics; Highwall slope stability analysis and design methodology; stability analysis and design methodology for waste dumps; Application of geotechnical investigation for design of ultimate pit slope and other design parameters. Numerical problems on slope stability analysis including mine waste rock dumps.

UNIT - III

Production And Equipment Planning: Determination of mine size and sequencing by nested pits; Cash flow calculations; Mine and mill plant sizing; Production scheduling. Stockpiling and blending, Spreaders and Reclaimers; computerized truck dispatch. Selection of mining system vis-à-vis equipment system; Computations for the capacity and number of machines vis-à-vis mine production. Machine availability, productivity, maintenance scheduling, preventive maintenance, control and monitoring inventory.

UNIT - IV

Health, Safety and Environmental Management: Occupational health hazards due to mine dust, poor lighting and ventilation, noise and vibration, radioactive emission; Accidents in Surface mining and their prevention; sump design and drainage patterns - pumping systems. Pre-drainage through diversion channels and boreholes; Water pollution, Methods of reclamation of mined out areas, dumps and tailing ponds, environmental audit. Socio-economic factors in surface mines.

UNIT - V

Modern Trends in Opencast Mines: Recent developments in mining methods and layouts. In pit crushing & conveying, continuous surface mining. Selective extraction and dumping. Extraction of seams developed/extracted by underground methods. Deep Open pit Mining; Placer mining and

solution mining – scope of applicability, sequence of development and machinery; Closure of surface mines.

TEXT BOOKS

1. Mining Engineering Handbook, 3rd edition, Vol I & II, Hartman, H. L. (Editor), SME Society of Mining Engineers, New York, 2011.
2. Fundamentals of Open Pit Mine Planning & Design, Hustrulid, W. and Kuchta, M., (eds)., Elsevier, 1995.

REFERENCE BOOKS

1. Proceedings of National Seminar on Surface Mining, IME Publications/ Calcutta, 1995.
2. Surface Mining Technology, Das, S.K., Lovely Prakashan, Dhanbad, 1994.
3. Modern Coal Mining Technology, Das, S.K., Lovely Prakashan, Dhanbad, 1994.
4. Surface Mining – 2nd Edition, SME, Kennedy, B.A., New York, 1990.

MN501PC: BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

B.Tech. V Sem.

L	T	P	C
3	0	0	3

Course Objectives:

1. To introduce the concepts of electrical circuits and its components
2. To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
3. To study and understand the different types of DC/AC machines and Transformers.
4. To import the knowledge of various electrical installations.
5. To introduce the concept of power, power factor and its improvement.
6. To introduce the concepts of diodes & transistors, and
7. To impart the knowledge of various configurations, characteristics and applications.

Course Outcomes:

1. To analyze and solve electrical circuits using network laws and theorems.
2. To understand and analyze basic Electric and Magnetic circuits
3. To study the working principles of Electrical Machines
4. To introduce components of Low Voltage Electrical Installations
5. To identify and characterize diodes and various types of transistors.

UNIT - I:

D.C. Circuits: Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation.

A.C. Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits , Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT - II:

Electrical Installations: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

UNIT - III:

Electrical Machines: Working principle of Single-phase transformer, equivalent circuit, losses in transformers, efficiency, Three-phase transformer connections. Construction and working principle of DC generators, EMF equation, working principle of DC motors, Torque equations and Speed control of DC motors, Construction and working principle of Three-phase Induction motor, Torques equations and Speed control of Three-phase induction motor. Construction and working principle of synchronous generators.

UNIT - IV:

P-N Junction and Zener Diode: Principle of Operation Diode equation, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Zener diode characteristics and applications.

Rectifiers and Filters: P-N junction as a rectifier - Half Wave Rectifier, Ripple Factor - Full Wave Rectifier, Bridge Rectifier, Harmonic components in Rectifier Circuits, Filters – Inductor Filters, Capacitor Filters, L- section Filters, π- section Filters.

UNIT - V:

Bipolar Junction Transistor (BJT): Construction, Principle of Operation, Amplifying Action, Common Emitter, Common Base and Common Collector configurations, Comparison of CE, CB and CC configurations.

Field Effect Transistor (FET): Construction, Principle of Operation, Comparison of BJT and FET, Biasing FET.

TEXT BOOKS:

1. Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University
2. Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath, McGraw Hill Education

REFERENCE BOOKS:

1. Electronic Devices and Circuits – R. L. Boylestad and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
2. Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, Satyabrata Jit, TMH, 2/e, 1998.
3. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6th edition.
4. Linear circuit analysis (time domain phasor and Laplace transform approaches) - 2nd edition by Raymond A. De Carlo and Pen-Min-Lin, Oxford University Press-2004.
5. Network Theory by N. C. Jagan& C. Lakshminarayana, B.S. Publications.
6. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
7. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
8. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
9. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989

MN502PC: MINE LEGISLATION AND GENERAL SAFETY

B.Tech. V Sem.

L	T	P	C
3	0	0	3

Course Objectives: Introduces mining laws and legislation to the students with basic knowledge on mining engineering aspects. The students will be explained about the provisions of Indian electricity rules, vocational training rules, The Mines rescue rules, The Mines and Minerals (Development and Regulation) Act etc.

Course Outcomes: As the outgoing student's career is mainly dependent on mining industry, exposure to state and central laws related to mining are highly solicited.

1. This course gives an opportunity for the students to understand the statutions requirement for coal/metal mining by opencast/underground methods.
2. Students get idea of how mining laws and legislation evolved in India
3. Students will understand statutory rules, regulations and byelaws etc.
4. Students acquire knowledge of accidents, causes of accidents and report preparation
5. Students will know about safety management, safety audit and their importance.

UNIT - I

Introduction to mining laws and legislation, General principles of mining laws and development of mining legislation in India. The Mines Act, 1952, The Mines Rules, 1955.

UNIT - II

The Mines Vocational Training Rules, 1966; The Mines Rescue Rules, 1985.
The Mines Maternity Benefit Act, 1961 in brief; Payment of Wages Act, 2005; NCWB agreement (in brief).

UNIT - III

Coal Mines Regulations, 2017; Metalliferous Mines Regulations, 1961.

UNIT - IV

Indian Electricity Rules, General provisions of Mines and Minerals (Regulation and Development) Act; The Mineral Concession Rules, 1960; The Mineral Conservation and Development Rules.

UNIT - V

General causes of accidents in mines and their prevention. Accident enquiry reports, cost of accidents, occupational diseases.
Safety management plan. Safety audit, risk management.

TEXT BOOKS:

1. The Mines Act, 1952.
2. The Mines Rules, 1955.
3. The Mines Vocational Training Rules, 1966.
4. The Mines Rescue Rules, 1985.
5. The Mines Crèche rules, 1996
6. The Employee's (Workmen's) Compensation Act, 2010.
7. Indian Electricity Rules, 1956.
8. Coal Mines Regulations, 1957.
9. Metalliferous Mines Regulations, 1961.
10. Mines and Minerals (Regulation and Development) Act 1957.
11. The Mineral Concession Rules, 1960.
12. The Mineral Conservation and Development Rules, 1988.

REFERENCE BOOKS:

1. Legislation in Indian Mines: A Critical Appraisal vol.1&2 – Rakesh and Prasad.

MN503PC: MINERAL PROCESSING

B.Tech. V Sem.

L	T	P	C
2	0	0	2

Course Objective: This course enables the students to choose suitable parameters and appropriate methodology & machinery for processing various types of minerals.

Course Outcome: At the end of this course:

1. The students will have knowledge on importance of mineral processing and treatment of ore & minerals.
2. The students will have knowledge on processing of minerals / ores / coal
3. The student will acquire knowledge on different types of crushers and grinding mills.
4. Gain knowledge on various types of sampling and concentration techniques.
5. In addition, gains knowledge on special methods of ore treatment and their flow sheets.

UNIT - I

Introduction: Scope, objectives, minerals/ores for mineral processing, methods of treatment, choice of methods, sequence of operations, product, flow sheets, ore sorting – hand / mechanical, electronic, removal of harmful materials, ore transportation.

UNIT - II

Comminution: Introduction to comminution, reduction ratio, primary/secondary/tertiary crushing, purpose, theory of crushing, types of crushers and comparison, general crushing and grinding flow sheet, wet/dry grinding, mechanism and various affecting parameters. Power consumption for crushing & grinding.

UNIT - III

Laboratory & Industrial Sizing and Sampling: Comparisons of different sampling techniques. Collecting sample on site (mine face); Purpose, factors governing particle behaviour - Sampling and weighing the ore, moisture and assay value, on stream analysis, automatic control in mineral processing, laboratory and industrial screens, trommels, vibrating screens, etc. wet and dry screening, classification, classifiers.

UNIT - IV

Separation/Concentration: Newton's and Stoke's Laws of particle settlement, different sampling techniques and their comparison, different concentration techniques – gravity, chemical froth flotation, wet & dry magnetic separation, electromagnetic, amalgamation, heavy media separation (Hons)& DMS, jigging, shaking tables, sluicing, spirals, thickeners, filtration, etc., Colour based sorting of minerals – optical sorter; Coal washing. Applications and limitations, electrical methods of concentration.

UNIT - V

Special Methods: Chemical extraction, cyanide process, leaching, use of ion exchange, solvent extraction, pilot plant studies on ores, tailing dams – mode of disposal, construction and design & other solid-waste (other than overburden) management in mines; generalised plant practice/flow sheets for coal and other important ores – copper, aluminum, lead, zinc, gold, uranium, iron, limestone, magnesite and beach sand minerals.

TEXT BOOKS:

1. Mineral Processing Technology, Wills, B.A, Pergamon Press, Oxford, 2006.
2. Ore Dressing, Jain, S.K, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, 1986.
3. Textbook of Mineral Processing, DV Subba Rao, - Scientific publishers 2017

REFERENCE BOOKS:

1. Principles of Mineral Dressing, Gaudin, A. M, Tata McGraw - Hill Publishing Co. Ltd., New Delhi, 2003.
2. Principles of Mineral Processing, Society for Mining, Metallurgy, and Exploration, Maurice C. Fuerstenau (Editor), Kenneth N. Han (Editor), 573 p, 2003.
3. Mineral Processing, 3rd Edition Prayor, E.J, (1974), Applied Science Publishers, London, p. 844.
4. Textbook of Ore Dressing, Richards, R. H, Charles E. Locke, S.B and Schuhmann, R, (1953), McGraw-Hill Book Company Inc, New York, p. 608.
5. Handbook of Mineral Dressing, Taggert, A. F, Chapman and Hall, New York, 1945.
6. Handbook on Mineral Dressing, Vijayendra, H. G, Vikas Publishing House Pvt. Ltd., New Delhi, 2001.
7. Mineral Processing Handbook, Volume – I &II, Weiss, N.L. (Ed.), S.M.E. 1986.

MN504PC: BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY

B.Tech. V Sem.

L	T	P	C
0	0	2	1

Pre-requisites: Basic Electrical and Electronics Engineering

Course Objectives:

- To introduce the concepts of electrical circuits and its components
- To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
- To study and understand the different types of DC/AC machines and Transformers.
- To import the knowledge of various electrical installations.
- To introduce the concept of power, power factor and its improvement.
- To introduce the concepts of diodes & transistors, and
- To impart the knowledge of various configurations, characteristics and applications.

Course Outcomes:

- To analyze and solve electrical circuits using network laws and theorems.
- To understand and analyze basic Electric and Magnetic circuits
- To study the working principles of Electrical Machines
- To introduce components of Low Voltage Electrical Installations
- To identify and characterize diodes and various types of transistors.

List of experiments/demonstrations:

PART A: ELECTRICAL

1. Verification of KVL and KCL
2. (i) Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
   (ii) Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star) in a Three Phase Transformer
3. Measurement of Active and Reactive Power in a balanced Three-phase circuit
4. Performance Characteristics of a Separately Excited DC Shunt Motor
5. Performance Characteristics of a Three-phase Induction Motor
6. No-Load Characteristics of a Three-phase Alternator

PART B: ELECTRONICS

1. Study and operation of
   (i) Multi-meters (ii) Function Generator (iii) Regulated Power Supplies (iv) CRO.
2. PN Junction diode characteristics
3. Zener diode characteristics and Zener as voltage Regulator
4. Input & Output characteristics of Transistor in CB / CE configuration
5. Full Wave Rectifier with & without filters
6. Input and Output characteristics of FET in CS configuration

TEXT BOOKS:

1. Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University
2. Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath, McGraw Hill Education

REFERENCES:

1. Electronic Devices and Circuits – R. L. Boylestead and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
2. Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, Satyabrata Jit, TMH, 2/e, 1998.

3. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6th edition.
4. Linear circuit analysis (time domain phasor and Laplace transform approaches) - 2nd edition by Raymond A. De Carlo and Pen-Min-Lin, Oxford University Press-2004.
5. Network Theory by N. C. Jagan & C. Lakshminarayana, B.S. Publications.
6. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
7. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
8. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
9. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.

MN505PC: MINERAL PROCESSING LABORATORY

B.Tech. V Sem.

L	T	P	C
0	0	2	1

Course Objectives: To introduce technology involved in crushing /grinding/classification and concentration
techniques.

Course Outcomes: The students will be able to

1. Determine the crushing and grinding characteristics of minerals.
2. Determine the efficiency of magnetic separator and forth flotation cell.
3. Know about different types of separators and sedimentation process.
4. Study the different types of mineral processing machinery components.

LIST OF EXPERIMENTS:

1. Study of grab sampling and different sample division techniques like coning and quartering, riffle sampling techniques, etc.
2. Determination of crushing characteristics of a given mineral sample using jaw crusher
3. Determination of the grinding characteristics of a given mineral sample using ball mill.
4. Sieve analysis of a given sample and to calculate (a) percentage CMF retained and percentage CMF passed through on screens (b) average size of sample material and (c) to plot sizing curves
5. Concentration of a given mineral using Wilfley table
6. Concentration of a given mineral using froth flotation cell
7. concentration of a given mineral using magnetic separator
8. Study of wash-ability characteristic of coal samples using sink-float tests.
9. Study of sedimentation characteristics of a given mineral sample
10. Determination of Hard Grove Grind-ability Index of ore or mineral or coal.
11. Determination of Bonds work index for rock or ore or mineral.

MN631OE: SUSTAINABLE MINERAL INDUSTRY (Open Elective-III)

B.Tech. VI Sem.

L	T	P	C
3	0	0	3

Course Objectives:

1. To understand the concept and importance of sustainable development.
2. To understand impacts of development activities and mitigation measures.
3. To understand current mining practices and their impacts on sustainable development.

Course Outcomes: At the end of this course, students will able

1. To understand the concept of sustainable development for mining industry.
2. To learn about legislative measures for sustainable development, environmental and social responsibilities of mining industry
3. To gain knowledge about current mining practices impacts, national mineral policy historical development and its sustainable practices.
4. To acquire knowledge on new technology for sustainable development such as coal bed methane, coal gasification and leaching of old dumps etc.
5. To know about case studies for innovative practices and their benefits in sustainable development

UNIT - I

Concept of Sustainable development for mining Industry-Sustainable development – a perspective of mineral professional community. International sustainability reporting and tools for measurement of sustainability. Milos statement on Sustainable mineral industry.

UNIT - II

Legislative measures for sustainable development- MMRD Act- star rating of Indian mines (Non-coal), Environmental responsibility – Corporate social responsibility. District mineral fund, its collection, utilization etc.

UNIT - III

Current status of mining practices and their impact on sustainability. Mining and environmental frame work, National mineral policies in mineral based countries. Indian national mineral policy, its historical development with the changing goals and sustainable practices. Issues of leases, auctions for mineral development in India.

UNIT - IV

Clean coal technologies, Coal bed methane, Abandoned coal mine methane, Underground gasification of coal. Leaching of old dumps and recovery of metals. Recycling of metals. Application of new techniques for sustainable development.

UNIT - V

Best mining practices for Sustainable mining- Case Studies Innovative practices for achievement of sustainability. Benefits of sustainability.

TEXT / REFERENCE BOOKS:

1. MMDL Act 2020 and amendments, Ministry of Mines.
2. Mineral concession Rules.
3. Guidelines of MOEF and Climate change- Annual reports of MOEF&CC, Ministry of Mines, Ministry of Coal in India.

MN632OE: TUNNELLING AND UNDERGROUND SPACE TECHNOLOGY
(Open Elective - III)

B.Tech. VI Sem.

L	T	P	C
3	0	0	3

Course Objective: This course enables the students to choose suitable parameters and appropriate methodology & machinery for driving tunnels and various underground roadways.

Outcome: The students will

1. Understand the scope and application of tunnelling engineering and types of underground excavations.
2. Obtain knowledge about different types of tunnelling methods and factors affecting the choice of selection of tunnelling methods
3. Have insight in to various drilling and blasting practices performed in tunnelling.
4. Know about the possibility of mechanisation of tunnelling and various machinery available and their cutting principles.
5. Learn about various ground treatment methods and tunnel services such as supporting, ventilation and drainage etc.

UNIT - I
Introduction: Scope and application, historical developments, art of tunneling, tunnel engineering, future tunneling considerations. Types of Underground Excavations: Tunnel, adit, decline, shaft; parameters influencing location, shape and size; geological aspects; planning and site investigations.

UNIT - II
Tunnel Excavations: Tunneling Methods: Types and purpose of tunnels; factors affecting choice of excavation technique; Methods - soft ground tunneling, hard rock tunneling, shallow tunneling, deep tunneling; Shallow tunnels – cut and cover, cover and cut, pipe jacking, jacked box excavation techniques, methods of muck disposal, supporting, problems encountered and remedial measures.

UNIT - III
Drilling and Blasting: Part A: Drilling - drilling principles, drilling equipment, drill selection, specific drilling, rock drillability factors; Blasting - explosives, initiators, blasting mechanics.
Part B: Types of cuts- fan, wedge and others; blast design, tunnel blast performance - powder factor, parameters influencing, models for prediction; mucking and transportation equipment selection.

UNIT - IV
Mechanization: Tunneling by Road headers and Impact Hammers: Cutting principles, method of excavation, selection, performance, limitations and problems. Tunneling by Tunnel Boring Machines: Boring principles, method of excavation, selection, performance, limitations and problems; TBM applications.

UNIT - V
Tunnel Services: Supports in Tunnels: Principal types of supports and applicability. Ground Treatment in Tunneling: Adverse ground conditions and its effect on tunneling; Excavation of large and deep tunnels, caverns. Tunnel Services: Ventilation, drainage and pumping; Tunneling hazards.

TEXT BOOKS

1. Rock Engineering Systems – Theory and practice, Hudson, J.A., Ellis, England.
2. Principles of Rock Fragmentation, Clark, G.B., (1987), John Wiley and Sons, New York.

REFERENCE BOOKS

1. Cities and Geology, Legget, R.F., McGraw-Hill, New York, 624 p., 1973.
2. Modern Trends in Tunnelling and Blast Design, Johansen, John and Mathiesen, C.F., AA Balkema, 154p, 2000.
3. Rock blasting and explosives Engineering, Per-Anders Persson, Roger Holmberg, Jaimin Lee, (1993), CRC Press, p.560.
4. Tunnel Engineering Handbook, Bickel, J.O., Kuesel, T.R. and King, E.H., Chapman &Hall Inc., New York and CBS Publishers, New Delhi, 2nd edition, Chapter 6, 544p, 1997.

MN611PE: MINE SYSTEMS ENGINEERING (Professional Elective – IV)

B.Tech. VI Sem.

L	T	P	C
3	0	0	3

Course Objectives: To make students familiar with scientific/Mathematical methods that are applicable to mining industry for optimizing objectives.

Course Outcomes: On completion of the course the students will be able to:

1. Apply LPP for optimizing complex problems.
2. Solve transportation and assignment problems.
3. Optimize sequencing problems.
4. Optimize using gaming theory.
5. Demonstrate the concepts of CPM and PERT.

UNIT - I

Development –Definition-Characteristics and Phases-Types of models-Operations Research models – applications.

Allocation: Linear Programming Problem Formulation – Graphical solution – Simplex method – Artificial variables techniques: Two–phase method, Big-M method.

UNIT - II

Transportation Problem – Formulation – Optimal solution, unbalanced transportation problem – Degeneracy.

Assignment problem – Formulation – Optimal solution - Variants of Assignment Problem- Traveling Salesman problem.

UNIT - III

Sequencing – Introduction – Flow **–**Shop sequencing – n jobs through two machines – n jobs through three machines – Job shop sequencing – two jobs through 'm' machines

Replacement: Introduction – Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely- Group Replacement.

UNIT - IV

Theory of Games: Introduction –Terminology– Solution of games with saddle points and without saddle points- 2 x 2 games – dominance principle – m x 2 & 2 x n games -graphical method.

Inventory: Introduction – Single item, Deterministic models – Purchase inventory models with one price break and multiple price breaks –Stochastic models – demand may be discrete variable or continuous variable – Single Period model and no setup cost.

UNIT - V

Waiting Lines: Introduction – Terminology-Single Channel – Poisson arrivals and Exponential Service times – with infinite population and finite population models– Multichannel – Poisson arrivals and exponential service times with infinite population.

CPM and PERT

Introduction to and importance of CPM. Determination of Early start time, Latest start time, Total float, independent float, critical path, project duration. Crashing of networks

Introduction to PERT, importance of PERT, expected time of completion of a project, probability of completion Application of CPM and PERT in mining industry.

TEXT BOOKS:

1. Operations Research /J. K. Sharma 4e. /MacMilan
2. Operations Research/Er. Prem Kumar Gupta & Dr. D. S. Gupta/S. Chand

REFERENCE BOOKS:

1. Operations Research/S. R. Yadav & A. K. /Oxford
2. Operations Research/ ACS Kumar/

MN612PE: ROCK SLOPE TECHNOLOGY (Professional Elective – IV)

B.Tech. VI Sem.

L	T	P	C
3	0	0	3

Course Objectives:

1. To introduce the basic mechanics of rock slope failures.
2. To learn the types of rock failure and its influencing parameters.

Course Outcomes: The students will able to

1. Know the fundamental mechanics of rock slope failure, types of failure and its influencing parameters.
2. Understand about geological parameters affecting slope stability, different properties of rocks, determination of shear strength and field measurements of rocks
3. Know details of plane and wedge failures
4. Know details of circular and toppling failure
5. Gain knowledge about slope failure monitoring and stabilization techniques.

UNIT - I

Basic Mechanics of Rock Slope Failure: Rock slope economics; continuum mechanics approach to slope stability; slope parameters; effect of water pressure; factor of safety of slopes; slope height vs slope angle; design of slopes.

UNIT - II

Geological and Rock Strength Properties: Geological parameters affecting slope stability; graphical representation of geological data; plotting and analysis of field measurements; physico-mechanical properties affecting slope stability, shearing on incline plane, determination of shear strength of rock and rock discontinuities; Ground water flow in rock masses; field measurement of permeability; measurement of water pressure.

UNIT - III

Plane Failure and Wedge Failure: Plane failure analysis; graphical analysis of stability; influence of ground water on stability; influence of tension crack; analysis of failure on a rough plane; rock reinforcement of slopes; Analysis of wedge failure; wedge analysis including cohesion and water pressure; Wedge stability charts for friction only; case studies. Numerical problems.

UNIT - IV

Circular and Toppling Failure: Conditions for circular failure; derivation of circular failure analysis; effect of ground water; circular failure charts; Bishop's and Janbu's methods of failure analysis; case studies. Types of toppling failure; secondary toppling modes; analysis of toppling failure; limit equilibrium analysis of toppling failures; Influence of slope curvature on stability; slope depressurisation; protection of slopes; control of rock falls; measurement and monitoring and interpretation of slope displacements. Numerical problems.

UNIT - V

Rock Slope Failure Monitoring and Slope Stabilization: Types of slope movement, Surface and Sub-surface monitoring methods inclusing instrumentation and techniques & Guidelines for monitoring programs. Causes of rock falls; Rock slope stabilization programs – stabilization by rock reinforcement & rock removal; protection measures against rock falls.

TEXT BOOKS:

1. Rock Slope Engineering, Hoek, E and Bray, J.W. Institution of Mining and Metallurgy, 1991.
2. Rock Mechanics, Goodman, R.E., John Wiley and Sons, 1989.
3. Engineered Rock Structures in Mining and Civil Construction, Singh, R.N. and Ghose, A.K.,

A.A. Balkema, Netherlands, 2006.

REFERENCE BOOKS:

1. Rock Slope Engineering, 4th Edition, Duncan C.Wylie and Chris Mah, CRC Press, 456p, 2004.
2. Guidelines for Open Pit Slope Design, 1st Edition, John Read and Peter Stacey, CRC Press, 510p, 2009.
3. Slope stability in Surface Mining, William A. Hustrulid (Ed), Michael K. McCarter (Ed) and Dirk J. A. Van Zyl (Ed), Society for Mining, Metallurgy, and Exploration, 442p, 2001.
4. Fundamentals of Rock Mechanics, 4th Edition, John Jaeger, N. G. Cook and Robert Zimmerman, Wiley-Blackwell; 4 edition, 488p, 2007.

MN613PE: DIMENSIONAL STONE TECHNOLOGY (Professional Elective – IV)

B.Tech. VI Sem.

L	T	P	C
3	0	0	3

Course Objectives: To familiarize students with the resources of dimensional stone in India & abroad and basic concept of mining techniques for all types of dimensional stones, processing techniques, multiwire technology and study about environmental impact in surrounding.

Course Outcomes: Dimensional Stone Technology is important to get idea to excavate blocks of marble, granite, sandstone etc.

1. Students will get an idea of resources for dimension stones and Indian dimension stone mining trend.
2. Understand the criteria for selection of dimension stone deposit and procedure of obtaining statutory permissions
3. Students get a benefit of detailed understanding of various techniques of dimensional stone mining including diamond wire saw, blind cut technique etc.
4. Also get the benefit of processing techniques such as gang saws, automatic tiling plant, multiwire machine for slab making etc.
5. Environmental impact due to mining and processing activities.

UNIT - I

Resources of Marble, Granite, Slate, as Dimensional stones in India and world, uses, marketing, export. Geological, mineralogical and physico-mechanical properties of dimensional stones, Criteria for selection of dimensional stone deposit, Procedure for obtaining mining lease and preparation of project proposal.

UNIT - II

Mining: Conventional mining of Sandstone, Limestone, Marble and Granite; Recent developments- wire saw including blind cut technique, chainsaw, belt saw, hydraulic splitting, flame jet cutting, water channeling etc; Blasting techniques in dimensional stone mines: various types of explosives used, controlled blasting for providing horizontal & vertical cut; Splitting by swelling material.

UNIT - III

Insitu splitting technique used in compact limestone (Kota stone) for utilization of waste as dimensional stone. Various types of loaders cranes and hydraulic excavator used in dimensional stone mines; Quarry layouts. Hole making technique using hole-finder and laser beam. Application and development of diamond tools, formation of stone block and their handling

UNIT - IV

Processing: Dressing- Mono block dresser; Sawing- gang saws, circular saws; Preparation and mounting of blades/discs and segments; slab repair by resin Polishing - Manual, Mechanical; Various types of polishing machines; Abrasives- type, use and selection, shaping; Tile preparation; Automatic tiling plant, slurry handling and treatment including water supply. Multiwire technology.

UNIT - V

Environmental impacts of mining and processing of dimensional stones; Secondary use of quarried land and waste of the industry; Land reclamation, Environmental management plan, Environment Protection measures.

TEXT BOOKS:

1. Dimensional Stone Technology, S. S Rathore., G. S. Bhardwaj and S. C Jain.

REFERENCE BOOKS:

1. Safety and Technology in Marble Mining and Processing in New Millennium, S. S., Rathore and V.; Laxminarayana, Proc. Of National Workshop held March 10-11 200 Udaipur.
2. Recent Development in Machinery and Equipment for Dimensional Stone Mining, S. S. Rathore, Y. C. Gupta and R. L Parmar, held Dec. 13-14, 2003 at Udaipur.

MN601PC: ROCK MECHANICS

B.Tech. VI Sem.

L	T	P	C
3	0	0	3

Pre-Requisites: NIL

Course Objectives:

1. To study and understand various aspects of rock mechanics and its application to mining.
2. Introducing the various instrumentation and measurement methods.
3. To study the theories of failure and approaches used for open pit and underground designs.
4. To Understand various aspects of supports and their design for various situations.
5. To know the various statutory aspects like CMR, MMR and the relevant DGMS circulars related to this course.

Course Outcomes: At the end of the course, students will be able to

1. Understand important terms used in rock mechanics, application of rock mechanics in mining, introduction to stress analysis
2. Understand Physical properties of rocks and rock indices.
3. Understand Mechanical properties of rocks
4. Understand Non-destructive testing methods and time dependent properties of rocks
5. Understand Theories of failure of rocks & Design of underground workings.

UNIT - I

Physical properties: Density, porosity, void ratio, moisture content, permeability. Mechanical Properties: Preparation of rock samples, determination of mechanical properties of rocks: compressive strength, tensile strength, shear strength, modulus of elasticity, poisson's ratio, cohesion, angle of internal friction, Protodyaknov`s strength index, longitudinal wave velocity, rock burst ability index, Schmidt rebound hardness number, slake durability index.

UNIT - II

Rock mass classification: Core recovery, Rock quality designation, Rock mass rating, Indian- geo mechanics classification, Q System, Geological strength index, Slope mass rating, rippability classification, Coal mine roof rating.

UNIT - III

Stress strain analysis: Analysis of stress and strain in two and three dimensions, Principal stress, stress ellipsoid, Determination of principal stress and strain invariants; Differential equilibrium equations; compatibility equation of stress and strains, Stress and strain transformation, Mohr's circle of stress and strain, Plane stress and plane strain condition.

UNIT - IV

Rock mass behavior: Confining pressures, effect of water, time, temperature. Insitu stress and their estimation; flat jack method, over coring method and hydro fracturing method; Horizontal and vertical stress, intact rock strength and deformability; measuring devices for load, stress and strain. Dynamic loading of rocks Time dependent properties of rock, creep, mechanism of creep of rocks – different stages, rheological models

UNIT - V

Rock failure theories: Coulomb, Mohr's – Coulomb, Hoek and Brown, Griffiths and Drucker – Prager and Its related calculations

TEXT / REFERENCE BOOKS:

1. Fundamental and application of rock mechanics, Deb D and Verma AK,. PHI publication
2. Finite elemnt method: concepts and application in geo mechanics, Debasis Deb.
3. Theory of Elasticity, SP Timoshenko, JN. Goodier.

4. Rock Mechanics and ground control, V Singh and B P Khare.
5. Rock Mechanics and design of structures in rock, Obert and Duvall.
6. Rock Mechanics, Jumikis.
7. Introduction to Rock Mechanics, Goodman.
8. Engineering rock mass classification, Binawiski ZT.
9. Rock mass classification, Singh & goel.

MN602PC: MINING GEOLOGY

B.Tech. VI Sem. **L T P C**
2 0 0 2

Course Objectives: This course is aimed at providing the necessary geological inputs required for a mining engineer. The components would help the mining engineering student to understand recognition of important minerals and rock units and their physic-mechanical properties, genesis, concepts of mineral prospecting, basic engineering geological aspects which is of immense use in mining engineering practices and tunneling projects.

Course Outcomes: At the end of the course, students will be able to

1. Know different types of land forms formed by rivers, wind, oceans and volcanoes.
2. Know igneous rocks, Sedimentary rocks, and metamorphic rocks.
3. Know Structural Geology and Stratigraphy.
4. Know Genesis of Mineral deposits and Mineral Resources of India.
5. Know Geological, geophysical and geochemical exploration of mineral deposits.

UNIT-I

Mineralogy: Physical properties, chemical composition and mode of occurrence of important rock-forming and ore-forming minerals and industrial minerals. Petrology: Distinguish characteristic features, mode of formation and mode of occurrence of important igneous, sedimentary and metamorphic rocks.

UNIT-II

Different types of mineral deposits and their classifications, engineering uses of important rocks.
Genesis of Mineral Deposits: Definition of ore, gangue, tenor and grade of ore, processes and formation of ore deposits including coal, petroleum and atomic minerals.

UNIT-III

Structural Geology: Strike and Dip, Fundamental types, characteristic features and mechanics of folds, faults, joints (fractures) and unconformities. Foliation, lineation and other structural controls. Determination of strata thickness, Dip and Strive calculations.

UNIT-IV

Mineral Resources of India: Geological time scale, ore forming process, Major and Minor mineral resources of India, Brief description of origin, environment and distribution of mineral deposits of India. Ore resource estimation.

UNIT-V

Mineral Exploration: Basics of Geological, Geophysical and Geochemical exploration of mineral deposits. Mineral Reserves: Estimation and determination of mineral reserves. Application of remote sensing and GIS in geological mapping and mineral exploration.

TEXT BOOKS:

1. Exploration and Mining Geology (2nd Ed.); 1987. John Wiley & Sons, New York.

REFERENCE BOOKS:

1. Mineral Resources of India, Krishna Swamy.
2. Mining Geology, Mc Kinstry.
3. Engineering Geology & Geotechnics, Krynine and Hudd.

MN603PC: ROCK MECHANICS LABORATORY

B.Tech. VI Sem.

L	T	P	C
0	0	2	1

Pre-Requisites: NIL

Course objectives:

1. To study the various of methods to determine the properties of rocks.
2. To study the operation of various instruments and equipment.

Course outcomes:

1. The students will have knowledge on strength and deformation characteristics of rock using different methods.
2. The students will able to perform test to determine the porosity of rocks
3. The students will able to understand weatherability of rocks through slake durability test
4. The students will acquire knowledge on drilability of rocks
5. The students will able to use different types of roof monitoring devices.

LIST OF EXPERIMENTS

1. Determination of RQD of rocks.
2. Determination of Protodyaknov index of a given rock sample
3. Determination of point load index strength of a given rock sample
4. Determination of porosity of rocks.
5. Determination of uniaxial compressive strength of a given rock sample
6. Determination of tensile strength of a given rock sample using Brazilian method
7. Determination of shear strength of rocks
8. Determination of modulus of elasticity of given rock sample using strain gauge.
9. Determination of triaxial strength of rock and drawing of Mohr's envelope
10. Determination of slake durability of rocks
11. Study of drillability index of rocks.
12. Study of different types of roof convergence and other ground control instruments.
13. Determination of time dependent deformation of rocks.

MN604PC: MINING GEOLOGY LABORATORY

B.Tech. VI Sem.

L	T	P	C
0	0	2	1

Pre-Requisites: Mining Geology

Course Objectives: To identify minerals, rocks, ores and geological structures. To learn geological mapping, remote Sensing

Course Outcomes: At the end of the course, students will be able to:

1. Identify the properties of rock forming and ore forming minerals
2. Determine the strike and dip planar features by clinometer compass. Mine Surveying
3. Identify the folds, faults and unconformities
4. Knowledge of geology mapping
5. Determine the unconfined compressive strength of important rocks. g techniques and geophysical methods

LIST OF EXPERIMENTS:

1. Identification and physical properties of important rock-forming and ore-forming minerals.
2. Identification and distinguishing characteristics of important igneous, sedimentary and metamorphic rocks.
3. Determination of strike and dip of planar features using brunton compass.
4. Study of models pertaining to folds, faults and unconformities.
5. Study and interpretation of Topographic Maps.
6. Study of Geological Maps of Telangana, Andhra Pradesh & India.
7. Study of Geomorphologic Map of India and Tectonic Map of India.
8. Study of Seismotectonic Atlas of India.
9. Vertical Electrical Sounding Survey to determine depth to water table & bed rock.
10. Determination of strike and dip of the deposits.

MN701PC: INTRODUCTION TO INSTRUMENTATION

B.Tech. VII Sem.

L	T	P	C
3	0	0	3

Course Objectives: To have a knowledge of

1. Electronic Instruments.
2. Pressure measurements.
3. Flow measurements.
4. Vibration, Viscosity and Humidity Level measurement.
5. Various analysers.

Course Outcomes: At the end of the course, students will able to

1. Gain knowledge on electronic instruments used in mines.
2. Perform pressure measurements with help of different pressure measuring instruments.
3. Describe different types of flow meters.
4. Acquire knowledge of vibration measurement, will provide a strong platform to understand the concepts on these subjects for further learning.
5. Learn about analysers used to analyse the work environment of mines.

UNIT - I

Electronic Instruments: CRO- Storage oscilloscope – Digital voltage meter (DVM) –Digital multi meter – XY Recorder, Strip chart recorder – Digital recording- Data logger – Introduction to virtual instrumentation.

UNIT - II

Pressure Measurements: Unit of Pressure – Manometers- Different types, - Elastic type pressure gauges – Bourdon tube – Bellows – Diaphragm – Elastic elements with LVDT and strain gauge – Capacitive type pressure gauge – Measurement of vacuum – McLeod gauge – Thermal conductivity gauge – Ionization gauge.

UNIT - III

Flow Measurements: Flow meters – Variable head type flow meter – Orifice plate – Venture tube – Positive displacement flow meter: Notating disc, Reciprocating piston, oval gear and helix type flow meter – Rota meter – Mass flow meters.

UNIT - IV

Vibration, Viscosity, Humidity, Level Measurement: Mechanical type vibration measuring instruments – Seismic instruments as an accelerometer - Vibrometers – Viscosity – Saybolt viscometer. Humidity – Hot wire electro type hygro meter - Dew cell – Electrolysis type hygrometer.

UNIT - V

Analysers: Dissolved Analyzer: Conductivity meter – pH meter – Dissolved oxygen analyzer – Sodium analyzer – Silica analyzer – Turbidity meter – Gas analyzer – NOx analyzer – H2S analyzer – CO and CO2 monitor, Dust & Smoke measurement.

TEXT BOOKS:

1. Principles of Measurement and Instrumentation, Alan S. Morrris, Print ice-Hall of India Pvt., Ltd. New Delhi, 1999.
2. Measurement Systems Application & Design, Ernest O Doeblin, Tata McGraw Hill Publishing Co., New. Delhi, 1999.

REFERENCE BOOKS:

1. Transducers and Instrument and Instrumentation, Murthy, D.V.S., Prentice Hall of India Pvt. Ltd. New Delhi.
2. Principle of Industrial Instrumentation, Patranabir, D., Tata McGraw Hill Publishing Co., New Delhi 1999.
3. Mechanical and Industrial Measurements, Jain, R.K., Khanna Publishing, New Delhi, 1999.
4. Instrumentation Engineers Hand Book (Measurement), Liptak B.G., Chilton Book Co., 1994.

MN702PC: MINE GROUND CONTROL

B.Tech. VII Sem.

L	T	P	C
3	0	0	3

Course Objectives: Aims at detailed explanation of ground control practices in both underground and open cast nines for extraction of coal and metal ore deposit.

Course Outcomes:

1. Students aspiring for moiré detailed knowledge on ground control issues related to underground and open cast mines can get adequate exposure to ground control practices in mines
2. Acquire knowledge on strata pressure redistribution, manifestation and insitu stresses measurement.
3. Students will understand about different types of roof supports and design of support system to manage roof pressure
4. Gain knowledge about design of underground structures and design of stable structures for safe mining in the future complex geomining situations
5. Acquire knowledge on subsidence, influencing parameters, prediction methods and preventing measures

UNIT - I

Definition and concept of ground control in Mines.
Ground control practice in Mines. Constraints on ground control design; characteristics of coal measure strata.

UNIT - II

Modern concept of strata pressure redistribution. Manifestation of strata pressure, convergence, load on prop, creep, heave, roof fall and facture systems due to mining. Insitu stress measurement, instrumentation.

UNIT - III

Roof support: Timber and steel supports, friction and hydraulic prop Arches, shotcrete, roof truss, roof bolts. Cable bolts
Powered supports stowing caving strip packing pump packing rock reinforcement.

UNIT - IV

Design of structures in rock; design of underground openings. Design of pillars, design of open pit slopes, waste dumps and embankments. Design of stopes.

UNIT - V

Subsidence: Theories of subsidence, factors affecting subsidence, prediction and measurement of subsidence. Damage and prevention of damage due to subsidence.
Bumps and rock bursts-causes, occurrence and control.

TEXT BOOKS:

1. Rock Mechanics and Design of structures in rock, Obert & Duvall.
2. Coal Mining Ground Control, Peng.

REFERENCE BOOKS:

1. Fundamental of Rock Mechanics, Jaeger and cook.
2. Rock Mechanics and Ground Control, V. Singh & B.P. Khare.

MN711PE: MINE PLANNING AND DESIGN (Professional Elective - V)

B.Tech. VII Sem.

L	T	P	C
3	0	0	3

Course Objectives:

1. To understand the planning of opencast & underground mines and equipment utilization.
2. To study project implementation and monitoring.

Course Outcomes: The students will

1. Have knowledge on planning of opencast mining, underground mining and equipment utilization.
2. Learn about initial designs, sequence of designs and various methods used to design ultimate pit configuration.
3. Able to perform capacity calculations, design mine entries, manpower management and calculate productivity indices.
4. Understand about planning and selection of appropriate machinery and able to perform their capacity calculations.
5. Acquire knowledge about project implementation and monitoring and about time management, scheduling etc.

UNIT - I

Introduction: Technical factors in mine planning, methodology of mine planning, short range & long range, Optimization Techniques in Mine Planning; mine plan preparation; Choice between surface and underground mining.

UNIT - II

Opencast Mining: Selection of initial mine cuts and geometrical considerations; location of surface structures, division of mining area into blocks, mine design, Impact of various parameters like depth, dip, stripping ratio, geology and strength of mineral and overburden on mine planning; Selection of Mining Systems; Development of Ultimate Pit Configuration (open pit limits) and its determination – hand method, floating cone technique(2D&3D), Lerchs-Grossmann algorithm and computer assisted hand method; Determination of optimum mine size and sequencing by nested pits; Lanes algorithm for estimation of optimum mill grade and production planning; calendar plan, production scheduling, economic productivity indices. Quality Control-Ore Blending; Planning for mine closure.

UNIT - III

Underground Mining: Design of mine entries – shafts, inclines, design of stopes – size, level interval, design of coal mining district, mine boundaries; design of shaft pillars and protective pillars, planning of production capacity , optimization of mine size – mine production capacity, layout of development drives / raises / winzes length of faces, planning of support systems, ventilation, layout of drainage system; Production planning & Production scheduling, selection of depillaring / stoping method, manpower management economic/ productivity indices, Productivity and quality control; Techno- economic analysis, Planning for mine closure.

UNIT - IV

Equipment Planning: Planning and selection of equipment, their capacities and population for different mining conditions. Maintenance planning and scheduling including spare management; Equipment information – performance monitoring and expert systems.

UNIT - V

Project Implementation and Monitoring: Pre-project activities – feasibility report, environmental clearance, detailed project report, sources of funds, import of technology, selection of contracts and

contract administration, time management, cost control material management system, project quality assurance, social responsibility.

TEXT BOOKS:

1. Principles of Mine Planning- Jayanth Bhattacharya, Allied Publishers, Delhi 2003.
2. Fundamentals of Open Pit Mine Planning and Design, Hustrulid, W. and Kuchta, M., (eds). Elsevier, 1995.

REFERENCE BOOKS:

1. Mining Modelling, Ehrenburger, V and Fajkos, A., Elsevier, 1995.
2. Innovative Mine Design for the 21st Century Elsevier, Bawden, W.F., and Archibald., J.F., 1993.
3. Mining Engineering Analysis, 2nd Edition, Society for Mining, Metallurgy, and Exploration, Christoper J. Bise, 2003.
4. Design of Underground Hard Coal Mines, Pazdziora, J., Elsevier, 1988.
5. Underground Hard Coal Mines, Swilski, and Richards, Elsevier, 1986.
6. Blasting in Underground excavations and mines, Singh, B. and Pal Roy, P., CMRS Dhanbad, 1993.
7. Longwall Mining, Peng, S.S. and Chaing, H.S., John Wiley & Sons, New York, 1984.
8. Opencast Mining – Technology and Integrated Mechanisation, Rzhevsky, V.V., MIR Publishers, Moscow, 1987.
9. Opencast Mining – Unit Operations, Rzhevsky, V.V., MIR Publishers, Moscow, 1987.

MN712PE: GEO-STATISTICS (Professional Elective - V)

B.Tech. VII Sem.

L	T	P	C
3	0	0	3

Course Objectives: To introduce and differentiate the classical statistics and geo-statistics for precise resource evaluation, reserve calculations and ore body modelling as important components of mining operations.

Course Outcomes: By the end of this course students will be able to

1. Understand the basic concepts of geo-statistics and statistical estimates.
2. Gain knowledge on semi-variogram and its application in mineral exploration.
3. Solve the different kriging system of equations and understand nugget effect.
4. Understand the concepts of mineral resource inventory and geostatistical simulation.

UNIT - I

Introduction to geo-statistics and statistical estimates using population and samples; Concept of Random variables; Probability and Lognormal distribution. Basics of Geo-statistics: Regionalized variable and data analyses

UNIT - II

Semi-variogram and variance estimation: Calculation of experimental semi-variograms; Mathematical models of semi-variogram and application in mineral exploration. Extension, Estimation Variance and Dispersion variance

UNIT - III

Introduction to Kriging: Linear, Ordinary and Simple kriging; Solving kriging system of equations for Point and Block Kriged Estimates and Kriging Variance with some examples number of samples. nugget effect. Influence of Nugget effect on kriging weights; Properties of kriging.

UNIT - IV

Geo-statistical evaluation of mineral deposits, ore body modelling, calculation of mineral resource inventory, grade-tonnage relationships, role of kriging variance in optimization of exploration drilling and misclassified tonnages.

UNIT - V

Basics of Geo-statistical Conditional Simulation.

TEXT BOOKS:

1. Geostatistics with Applications in Earth Sciences- D D Sharma-Springer
2. Multivariate Geo-statistics: An Introduction with Applications- Hans Wackernagel-Springer

REFERENCE BOOKS:

1. Solved Problems in Geo-statistics- Oy Leuangthong , K. Daniel Khan, Clayton V. Deutsch-Wiley
2. Mineral Resource Estimation- Mario E. Rossi, Clayton V. Deutsch-Springer

MN713PE: ROCK EXCAVATION ENGINEERING (Professional Elective - V)

B.Tech. VII Sem.

L	T	P	C
3	0	0	3

Course Objectives: To understand the rock mechanics, rock cutting technology, rock cutting tools and rock excavating machine

Course Outcomes: The students will

1. Have knowledge about mechanism of rock excavation process and different rock fragmentation methods.
2. Know about the influence of different rock properties in rock excavation such as abrasivity, lamination and joints etc.
3. Acquire knowledge on rock cutting technology
4. Understand about different types of cutting tools, their mechanism and application
5. Have insight in to rock excavating machines, their application and technical indices of machines.

UNIT - I

Introduction: Concepts, historical developments in rock excavation systems, factors affecting the rock fragmentation, mechanism of rock breakage and fracture; their application to rock fragmentation methods– explosive action, cutting, ripping and impacts.

UNIT - II

Rock Properties: Rock properties related to excavation process; application of compressive, tensile and tri- axial strengths, index tests and abrasivity, anisotropy, elasticity, porosity, laminations, bedding and jointing in rock fragmentation process.

UNIT - III

Rock Cutting Technology: Mechanism of drilling – rotary, percussive, rotary percussive, mechanics of rock cutting, theory of single tool rock cutting, crack initiation and propagation, breakage pattern, rock excavation by cutting action – picks, discs, roller cutters, water jet cutting, methods of evaluation of drill ability and cut ability index of rocks.

UNIT - IV

Rock Cutting Tools: Rock cutting tool materials, different types, relative applications and their choice, tool shape and size, specific energy consumption, tool wear, effect of operational parameters on tool performance, maintenance and replacement of cutting tools of excavating machines.

UNIT- V

Rock Excavating Machines: Excavating machines, principles, operation, applicability and technical indices of road headers, TBM'S coalface machines and bucket wheel excavators.

TEXT BOOKS:

1. Introductory Mining Engineering, Hartman, H.L., John Wiley and Sons, New York, 1987.
2. Principles of Rock Fragmentation, Clark, G.B., John Wiley and Sons, New York, 1987.

REFERENCE BOOKS:

1. Mining Engineering Handbook, 3rd edition, Vol I & II, Hartman, H. L. (Editor), SME Society of Mining Engineers, New York, 2011.
2. Diamond Drilling, Chugh, C.P., Oxford-IBH, 1984.

MN721PE: MINE ECONOMICS (Professional Elective - VI)

B.Tech. VII Sem.

L	T	P	C
3	0	0	3

Course Objectives:

1. Study of estimation and valuation of mineral deposits
2. Study of project appraisal
3. Study of finance and accounting

Course Outcome: The students will have knowledge on

1. Role of mining industry in national economy and risk factors in mine investment
2. Different sampling methods and estimation of reserves.
3. Different mine economic valuation methods like profitability index and hoskold's two rate method.
4. Evaluation of exploratory mining areas and various project appraisal methods.
5. Finance, accounting and cost estimation of various mining operations.

UNIT - I

Introduction: Mineral industry and its role in national economy; world and national mineral resources; special risk factors in mine investment and evaluation; national mineral policy,2009.

UNIT - II

Sampling and Ore Reserve Estimation: Methods of sampling, sampling frequency; analysis of sampling data, introduction estimation of reserves, introduction to geo-statistical methods, classification of reserves.

UNIT - III

Mine Valuation: Time value of money; annuity; redemption of capital, net present value; depletion allowance; depreciation; inflation; escalation; rates of return; Hoskold's Two rate method; capital and operating cost including wages, incentives, material; assets; liabilities; cash flows and discounted cash flow; profitability index – their implications in mine economic evaluation.

UNIT - IV

Project Appraisal: Methods of project evaluation – pay back, annual value, benefit/cost ratio, ERR and IRR, etc., evaluation of exploratory mining areas and operating mines; mine project financing, its risks and constraints; mine taxation; critical impact of depreciation, depletion, type of funding, reserves, life, on mine profitability.

UNIT - V

Finance and Accounting: Sources of mine funds – shares, debentures, fixed deposit, sinking fund, capital gearing, P & L account, balance sheet, typical case studies of mine feasibility. Cost estimation of individual mining operations and overall mining cost, cost control methods.

TEXT BOOKS:

1. Mineral and Mine Economics, Deshmukh, R.T., Mira Publications, Nagpur, 1986.
2. Courses in Mining Geology, Arogyaswamy, R.N.P. Oxford and IBH Publishing Co., 1994.

REFERENCE BOOKS:

1. Mine Management, Sloan, D.A., Chapman and Hall, London, 1983.
2. Mineral economics, Chatterjee, K.K., Wiley Eastern, 1992.
3. Examination and Valuation of mineral property, Park, R.J.
4. How to read a balance sheet ILO 1992.
5. Indian Mining Year Book 1994 – MMRD Act and Mineral Concession Rules.

MN722PE: MINERAL EXPLORATION (Professional Elective - VI)

B.Tech. VII Sem.

L	T	P	C
3	0	0	3

Course Objectives: Expose the mining engineer to various aspects of prospecting and exploration methods for search of important ore minerals using different geological, geophysical and geochemical techniques.

Course Outcomes: The students will be able

1. Understand the procedures for exploration of mineral deposits, estimation of mineral resources
2. Acquire knowledge on sampling methods, geological maps and machinery used for exploration.
3. Get knowledge on dispersions of elements, geo-chemical exploration and interpretation of geochemical surveys
4. To perform data collection at any stage of exploration.

UNIT - I

Geological Prospecting and Exploration: Definitions and Principles; Methods of Prospecting; Methods of Exploration.

UNIT - II

Sampling: theory and methods; Geological plans and sections for orebody evaluation; Exploration drilling, drill core logging and sampling Cut-off grade concepts and applications; Resources and Reserves. Estimation of reserves – methods and practice.

UNIT - III

Geochemical Exploration: Introduction, Geochemical cycle, geochemical mobility and association of elements. Pathfinder and target elements for geochemical exploration. Principles of geophysical exploration methods.

UNIT - IV

Primary and secondary dispersions of elements; Determination of background, and geochemical anomalies; Geo-chemical methods of mineral exploration: Procedures for geochemical sampling; Interpretation of geochemical surveys. Indian case studies.

UNIT - V

Collection of data along Geological (G), Feasibility (F) and Economic (E) axes during various stages of exploration.

TEXT BOOKS:

1. Techniques in Mineral Exploration: Reedman, J H., 1979. Applied Science Publishers Ltd, UK
2. Exploration and Mining Geology (2nd Ed.), Peters, W.C. 1987. John Wiley & Sons, New York.

REFERENCE BOOKS:

1. Tables for Mineral Identification, Sharma, N L and Agarwal Y K.
2. Ore Geology and Industrial minerals- An introduction (III edn.) Geo-science, A.M. Evans. 1997, Texas.

MN723PE: MINE SUBSIDENCE ENGINEERING (Professional Elective - VI)

B.Tech. VII Sem.

L	T	P	C
3	0	0	3

Course Objectives: To familiarize the student with the specialized knowledge on mechanism, prediction, control of subsidence due to underground mining.

Course Outcomes:

1. Students will get an opportunity to understand the effects of underground mining on the surface and subsurface structures.
2. Understand the subsidence mechanism such as zones movement, angle of draw and angle of break etc.
3. Acquire knowledge of subsidence prediction methods
4. Obtain knowledge on types of stresses and stress-strain behavior of soils
5. Design of methods to minimize the damage to structures and laws governing mining subsidence.

UNIT - I

Introduction: Strata movement at the mining horizon, convergence in mine working, factors influencing convergence in mine working.

UNIT - II

Subsidence Mechanism: Zones of movement in the overlaying beds, vertical and horizontal movement, subsidence trough, angle of draw, angle of break, sub-surface subsidence.

UNIT - III

Subsidence Prediction: Different methods of surface subsidence prediction – graphical, analytical, profile function, empirical and theoretical models.

UNIT - IV

Time Influence and Impact on Structures: Influence of time on subsidence, example from long wall and bord and pillar working. Calculation of ground movement over time. Types of stress on structures, stress-strain behavior of soils, damage to surface structures due to mining.

UNIT - V

Subsidence Control, Governing Laws and Standards: Measures to reduce subsidence due to mining. Laws governing mining damage, different standards suggested for mining and building ground in respect of subsidence. Case studies of Mine subsidence

TEXT BOOKS:

1. Subsidence occurrence prediction and control - Whiltaker B.N. Reddish D.J.
2. Mine Subsidence Engineering - Kratzsch H.

REFERENCE BOOKS;

1. Mine Subsidence –Singh B.
2. Surface subsidence Engineering – Peng S.

MN703PC: COMPUTER APPLICATIONS IN MINING LABORATORY

B.Tech. VII Sem.

L	T	P	C
0	0	2	1

Course Objective: To study the computer programming for mining problems, mine ventilation network analysis, modeling of surface and underground workings using various software.

Course Outcome: At the end of this course, the students will able to

1. use the SURPAC software for surface and underground mining methods.
2. use the ANSYS software for Design of pillars, barriers and panels.
3. use the ventilation software for creating ventilation networks and modelling of airflow.
4. use the blasting software for fragment analysis and optimum blast design.
5. use the slope stability software for slope stability analysis.

LIST OF EXPERIMENTS

1. Design of pillars, barriers and panels using ANSYS software.
2. Blast design
3. Subsidence prediction using ROCSCIENCE software.
4. Mine ventilation network analysis.
5. Modelling of airflow through underground workings using CFD.
6. Slope stability analysis in pit and dumps.
7. Fragmentation Analysis using FRASLYST software.
8. Surface Mine Design using SURPAC Software
9. Pit optimization using SURPAC Software

REFERENCE BOOKS:

1. E Balagurusamy, Fundamentals of Computers, Mc Graw Hills Publication, 2009
2. MPD Software Manual.
3. Fragalyst Software Manual)